International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 5 Sep-Oct 2022, pp: 718-721 www.ijprajournal.com ISSN: 2456-4494

Advanced Bilayers- Tablet Techniques- A Review

Sadhana S. Kathole*, Kshitija D. Kakade*,
Department of Pharmacy, Aurangabad, Maharashtra
Dr. Vedprakash Patil Pharmacy College, Aurangabad

Submitted: 20-09-2022 Accepted: 30-09-2022

ABSTRACT: Medicines are not only a science; it is also an art. Drugs are rarely administered as pure chemical substance alone and are almost given as formulated preparations and medicines. Oral route of dosage form is the most familiar administering drug, and tablets of disparate types are the most common type of solid dosage form in present day time. The term 'tablet' (from Latin tabuletta) is associated with the appearance of the dosage form,i.e. tablets are small disc-like or cylindrical specimens. Modified release tablet formulations including, layered tablets such as In-lay tablet, Bi-layered tablet, Medicated chewing gum, Tablet tarts, Pastilles, Lollipop, Tablet inserts, Clinicaps, Caplets, Child ecstasy tablet and Tablet in tablet are new entries in pharmaceutical market.

KEYWORDS: Tablet in tablet, Layered tablets, caplets, Wet granulation method, Dry granulation method, Direct Compression method.

I. INTRODUCTION

The oral route of drug administration is the most important method of administering drugs for systemic effects. In which, tablets and capsules are mostly used by the oral route of administration. Tablets and capsules represents the oral dosage forms in which one usual dose of the drug has been accurately placed. According to Indian Pharmacopoeia pharmaceutical tablets are solid, flat or biconvex dishes, unit dosage form, prepared by compressing a drug or a mixture of drugs, with or without diluents and a compressed solid dosage form containing medicaments with or without excipients. Patient acceptability is higher in tablets as it is easy to swallow and self administration is possible. In addition to active pharmaceutical ingredient (API), tablet dosage form consists of various ingredients such as diluents, binders, lubricants, glidants, anti-adherents, disintegrating agents, coloring agents, flavoring agents, absorbents, etc. [1-3]
Tablets are generally classified as following types :- [4,5]

Tablets

1. Tablets Ingested orally	2. Tablet used in oral cavity	3. Tablet administered by other route	4. Tablet used to prepare solution
Compressed tablets	Buccal tablet	Vaginal tablet	Effervescent tablet
Multiple layer tablet	Sublingual tablet	Rectal tablet	Dispensing tablet
Delayed release tablet	Lozenges and troches	Implants	Hypodermic tablet
Sustain release tablet	Dental cone		Tablet triturate
Film coated tablet			
Chewable tablet			
Sugar coated tablet			

Tablet are generally prepared by some techniques i.e. Wet granulation method, Dry granulation method and direct compression method.

1. Wet Granulation Method :-

Wet granulation is a process of using a liquid binder to lightly agglomerate the powder mixture. This method involves steps like weighing of ingredients, mixing, granulation,and screening of damp pass, drying, lubrication and compression of tablets. The amount of liquid has to be properly controlled, as over-wetting will cause the granules to be too hard and under-wetting will cause them to be too soft and friable. The main active ingredient, diluent, disintegrant are blended together and then it is allowed to pass through the sieve (sifting). Solutions of the binding agents are added to the initial mixture with stirring. The amount of binding agent added should be sufficient in order to avoid over wetting of the tablet [46-60]. If the powder is not wetted properly, the granules will be too soft and can be broken down during lubrication, which is difficult during compression of tablet. Tray drying is most common method of drying the tablet granules. Tray drying was commonly used method of drying tablet granulation in the past, which might be replaced by fluid-bed dryers as a novel approach. After drying the granules, they are allowed to pass through the screen; usually 60-100 mesh nylon cloth is used. After granulation, lubricant is added as fine

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 5 Sep-Oct 2022, pp: 718-721 www.ijprajournal.com ISSN: 2456-4494

powder which is required for proper filling of the die cavity.

2. Dry Granulation Method :-

Dry granulation processes create granules by light compaction of the powder blend under low pressures. This method is used for tablet preparation, in case of tablet ingredients are highly sensitive to moisture or unable to withstand elevated temperatures during drying, slugging may be used to form the granules. The compacts so-formed are broken up gently to produce granules(agglomerates). This process is often used when the product to be granulated is sensitive to moisture and heat. Dry granulation or double compression, usually eliminates various steps which involves slugging of the powder mass. The active ingredient, diluent and lubricant are blended together to form the slug. Thus, the compressed slug is passed through the mesh or through the mill and the remaining lubricant is added to the granulation, blended properly and compressed to form the tablets. Dry granulation is simpler than wet granulation, therefore the cost is reduced.

3. Direct Compression Method :-

Direct compression involves direct compressing the powdered material into tablets. Direct compression is adopted, if drug constitutes major portion of tablet [86-90] total weight. Tablets containing 25% or less of drug substance can be formulated, with a suitable diluent which acts as a carrier or vehicle for the drug. Tablets prepared by above method are subjected to compression machine which may be single station or multiple stations. The technology involved in this method assumes great importance in the tablet formulations, because it is often the cheapest means, particularly in the production of generics that the active substance permits. Direct compression avoids many of the problems associated with wet and dry granulations. Its successful applications in tablet formulation rests on the availability of suitable excipients and machinery. [2,9,10,11]

Comparison of various steps used in different methods of tablet manufacturing processes :-

	Wet Granulation	**Dry Granulation**	**Direct Compression**
1.	Milling of all solid ingredients	Milling of all solid ingredients	Milling of all solid ingredients
2.	Mixing of powders	Mixing of powders	Mixing of powders
3.	Preparation of binder solution	Primary compression to make slugs	Tablet compression
4.	Mixing of binder solution to powder mixture to form wet mass	Screening of slugs	
5.	Screening of wet mass through 6-12 mesh screen to form granules	Mixing with lubricant and disintegrating agent	
6.	Drying of moist granules	Tablet compression	
7.	Screening of dry granules through 14-20 mesh screen		
8.	Mixing of screened granules with lubricant and disintegrant		
9.	Tablet compression		

In recent trends in tablet technology reduce the manual input and performing the process validation of each unit operation thus ensuring enhance product quality and process reliability. In which it contains formation of layered tablets, caplets and tablet in tablet technology.

Bilayer Tablets:- Bilayer tablet is a new era for successful development of controlled release formulations that have various features to provide successful drug delivery. In the last decades, interest in developing a combination of two or more than two active pharmaceutical ingredient in a single dosage form has increased in the pharmaceutical industry, endorsing patient convenience and compliance. Bilayer tablet can be a primary option to avoid chemical incompatabilities occurs between APIs by physical seperation and to allow the development of different drug release profiles that are immediate release with extended release. The primary objective of sustained release drug delivery is to provide the safety and to improve efficacy of drugs. Bilayer tablet is suitable for the sequential release in combination of two drugs, for the seperation of two incompatible substances and also for sustained release tablet having one layer is immediate release as an Initial dose and second layer is maintainance dose as sustained release.

Inlay Tablets:- Inlay tablet is a type of layered tablet in which instead the core tablet being completely surrounded by coating and the top surface is completely exposed. Tablet compression was done with core rod tooling in which drug is incorporated in cup portion and the other surface of the core is exposed to the outside. While preparing only the bottom portion of the die cavity is filled with the coating material and core is placed upon it.

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 5 Sep-Oct 2022, pp: 718-721 www.ijprajournal.com ISSN: 2456-4494

Multilayer Tablets :- Multilayer tablets provides the option to combine drug release scenarios for the same API, enabling the manufacturers to develop drugs with instant and sustained release. Dividing a tablet into two layers seperated by an insulation layer can help manufacturer address issues with ingredient incompatability. This is advantageous for patients that are otherwise required to take the same tablet multiple times in a day, thus improving therapeutic compliance. There are additional process parameters to be controlled like the tamping force, dosage height and filling. Quality attributes like interlayer adhesion are to be considered to avoid tablet defects at production scale.

Caplets :- Caplet is a dosage form of a drug which enters the body, reaches the site of action and exerts its action. The caplets are oval in shape and it is a tablet like any other tablet, but should be differs only is being a smoothly-coated tablet shaped like an ordinary capsule. It is used as an alternative to the capsules and can easy to swallow dosage form. So that it is used as an alternative to a regular tablet. For ex., Calci-D film coated caplets used for patients with calcium deficiency, represents as blisters of 10 caplets. Excedrin migrain caplets contain aetaminophen, aspirin and therapeutically active caffeine, are used for pain reliever. [3,6,7]

Tablet in Tablet :- The Tablet in Tablet is also known as compression coating or solvent-free coating technique. The coating technology having certain limitation or drawbacks to overcome this limitation Tablet in Tablet is one of the best alternatives. The present work aims to comprehensively review the formulation, characterization and challenges in the development of Tablet in Tablet dosage form. Currently a very less number of patents are filed or granted on this topic; it includes the patent on the Tablet in Tablet of cyclophosphamide and capecitabine and here we focused on the rationable behind the development of such dosage form. The coating also gives physical and chemical protection to the drug; apart from this, it will also modify the release behavior of the drug. In the nineteenth century, to mask the bitter taste, modern pharmaceutical coating i.e. sugar coating was applied. Sugar coating having certain drawbacks or limitations; it has required long processing time up to 6 to 7 days; it required multistep operation (sealing, subcoating, smoothing, coloring, polishing, etc.) for that skilled operator required. It also has problems like coating process without automation, weight gaining, and sugar solution susceptible to bacterial growth which led to discovery of other coating techniques. The processing time required in sugar coating was majorly reduced in film coating. In 1954, Abbott Laboratories was launched first film-coated tablet in the market. In coating technology, the film coating makes the fastest revolution; it offers batch to batch consistency in the formulation development; it can be applied for different dosage forms, and easy process control and process automation is possible. The aqueous and organic based polymeric solutions were easily used in the process of film coatings, but both of these polymeric solutions have their disadvantage The organic solvents used for film coating have some drawbacks of flammability and toxicity, residual solvents in film, and the cost of organic solvent. In the case of aqueous film coating, heat requirement and prolong drying period well increase the total manufacturing cost and are a major disadvantage.

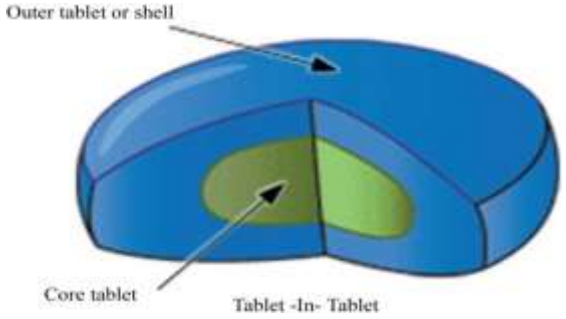
The compression coating technique was firstly introduced by Noyes in an 1896 patent. In the development of a new drug delivery system, the compression coating is one of the best alternatives, a novel coating technology. It has been used for a different purpose in the pharmaceutical such as the development of modified release, pulsatile release, colon-specific release, and programmable release. According to the various available literature, the press coating technology is used for the development of tablet like as compress coating tablets, e.g., development of glipizide tablet which is designed to achieve zero-order release.

To overcome the trouble of film or sugar coating, Tablet in Tablet or compress coating introduces as alternating coating technique. It is also recognized as a dry coating or press coating and was one of the first solvent free-coating techniques. In general, a Tablet in Tablet or compression-coated tablet consists of two parts; one is an internal drug core, and another is an outside coating shell. The outer layer surrounds the inner core, and it mainly controls the strength of the film coating, the release of the drug, and the stability.

Advantages of Tablet in Tablet technology :-

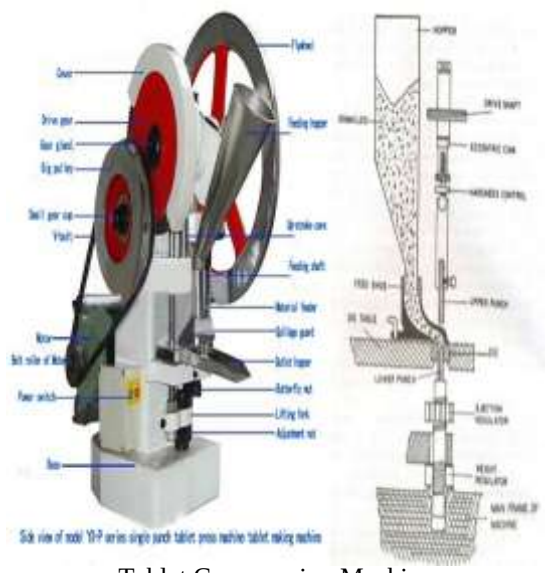
1. Separation of incompatible material can be achieved in the core and outer shell.
2. It will use to develop a modified release product (e.g., delayed release product).
3. The Tablet in Tablet of two different drugs can be targeted in two different areas of the gastrointestinal tract.
4. The need for a separate coating process of the tablets can be avoided in the press coating of the core and coating layer.
5. It is a solventless coating, so it is not hazardous to the environment.
6. The pharmacokinetic interaction (drug–drug) between concomitantly administered medications can be avoided in Tablet in Tablet dosage form by creating the time interval in their release.
7. The Tablet in Tablet dosage form gives protection to the hygroscopic or thermoliable drug.
8. In single Tablet in Tablet dosage form immediate release and sustain release effect of a similar drug or different drug combination can be achieved. [4,6]

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 5 Sep-Oct 2022, pp: 718-721 www.ijprajournal.com ISSN: 2456-4494



The internal core and outer layer are the two parts of the Tablet in Tablet dosage form. The internal core is a small tablet and prepared by using a somewhat small size of tooling used for the preparation of the outer coat. After internal tablet core was produced it is placed to another die which is larger than core tablet then the remaining amount of coating powder placed on the top of core tablet and compressed resulting in the formation of tablet within tablet. Conventional dry coating or Tablet in

Tablet manufacturing methods depicted as above can create problems like non-core, double-core, off-center and inlay caused by the core tablet transport system. Hence, dry coating or Tablet in Tablet is not widely used as conventional tablets. The compression of the core tablet in advance is the primary requirement in the above mention method, so it will increase the overall manufacturing cost of the dosage form. To resolve the problems related to the manufacturing of conventional dry coating methods, Tablet in Tablet formation, new one-step dry coating (OSDrC) equipment was introduced and has brought revolution in tablet manufacturing. [7,12]



Tablet Compression Machine

REFERENCES:-

[1]. L. Lachman, Herbert A., Lieberman L. Kanig: The theorey and practice of Industrial Pharmacy, Varghese publication house, 3rd edition, 1987, P.P. 293-373.
[2]. Aulton- Pharmaceutics-The- design and manufacture of medicines- 5th edition- [Konkur.in] P.P. 517-533.
[3]. Ankit V., Surya G., Review article of Recent advancement in Tablet Technology: The need of Hour; International Journal of Pharmaceutics and Drug Analysis, Vol.3, Issue 12, 2015,P.P. 423-429.
[4]. The Theorey and Practice of Industrial Pharmacy, 4th edition by Roop k., SP VYas, Farhan A., Gaurav J., P.P. 449-545.
[5]. Tejaswini U., A Brief Review on Tablet and Its Types: Journal of Advancement in Pharmacology Volume 1 Issue 1, P.P. 2-11.
[6]. Sachin G., Sanjay K., Review on Tablet in Tablet Techniques:Beni-Seuf University Journal of Basic and Applied Sciences, Vol. 9:1, P.P. 1-7.
[7]. https://www.pharmapproach.com/manufactureofpharmaceutical-tablets/
[8]. https://pharmaeducation.net/tablercompressionmachine/
[9]. https://www.pharmaguideline.com/2018/09/manufactureoftabletsbydirectcompression.html?m=#:~:text=from%20the%20term%20%E2%80%9cdirect%20compression,powder%20API%20or%20other%20excipients.
[10]. https://www.hmicronpowder.com/industry/pharmaceutical/dry-granulation-of-pharmaceuticals/
[11]. https://www.pharmatips.in/Articles/production/Wet-Granulation-Process-Tablet-Manufacturing.aspx
[12]. https://www.pharmaceutical-technology.com/sponsored/top-trends-in-tablet-manufacturing/