Optimization of various tablet excipients

Conventional tablets

Excipients are utilized in traditional tablets to keep BAF in a compressible mass that can be crushed to release BAF from the tablet into body fluids. As a result, the tablet is known as a simple tablet [3]. For instant release tablets, the standard tablet is most commonly utilized [3–6]. Conventional tablets have been designed for herbal preparations, nutraceuticals, and even probiotic microorganisms in addition to their application in medicine [7–9]. In recent medication development trends, customized BAFs such as nanosuspension, liquid-solid, and solid dispersion drug are replacing regular tablets [10–12]. The survival of bacteria in the excipient, which is referred to as viability in the probiotic tablet, is also regarded as a significant element in formulation optimization [8].

Tablet preparations have very good reception. The ease of handling from the producer and patient side is the advantage of tablet preparations [2]. Therefore, many researchers are developing tablets with various matrices that have their intended use according to the need for safer and more effective therapy. This review summarizes various additives in tabletting. It's has been developed according to the type of tablet and the experimental design approach that has been used for development. Ordinarily, additives in different tablet types require properties to support the desired tablet profile. It is necessary to identify critical points in the relevant tablet evaluation. Reviewing the additives in various tablets will be useful information for formulators in preparing the tablet design.

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Conventional tablets

Excipients are utilized in traditional tablets to keep BAF in a compressible mass that can be crushed to release Drug Material into body fluids. As a result, the tablet has earned the moniker of "basic tablet" [3]. The regular tablet is most widely used for rapid-release tablets [3–6]. In addition to their use in medicine, conventional tablets have been produced for herbal preparations, nutraceuticals, and even probiotic bacteria [7–9]. In recent medication development trends, customized drug materials such as nanosuspension, liquid-solid, and solid dispersion drug materials are replacing regular tablets [10–12].

Excipients in traditional tablets are used to contain drug in a compressible mass that can be crushed to release BAF from the excipient into body fluids. As a result, the tablet is known as a simple tablet [3]. For instant release tablets, the standard tablet is most commonly utilized [3–6]. Conventional tablets have been designed for herbal preparations, nutraceuticals, and even probiotic microorganisms in addition to their application in medicine [7–9]. In recent medication development trends, customized BAFs such as nanosuspension, liquid-solid, and solid dispersion drug are replacing regular tablets [10–12]. The survival of bacteria in the excipient, which is referred to as viability in the probiotic tablet, is also regarded as a significant element in formulation optimization [8].

The formulation factors used as independent variables in the optimization of a conventional tablet include fillers, binders, disintegrants, glidants, and lubricants [5, 7]. In addition to formulation factors, process parameters are also involved in the development of conventional tablet preparations, which include the speed and duration of a mixing [7].

Several experimental designs that have been used for the development of conventional tablets include a variety of factorial designs [6, 9], central composite design [8, 11, 15], Box- Behnken design [4, 16, 17], simplex lattice design [7], simplex centroid design [13], optimal mixture design [18].

Fast disintegrating tablet (FDT)

FDT is a preparation with excipients capable of disintegrating in a liquid atmosphere in less than 1 minute. There are two ways to use FDT: dissolved in water and then drunk, and put in the mouth until the excipient disintegrates in the mouth. Tablets with a second use are referred to as orodispersible tablets (ODT). The purpose of FDT is to increase bioavailability in the pre-gastric area, increase the therapeutic effect, and increase drug adherence and acceptance in geriatric and pediatric patients [19–21].

Several quality characteristics in FDT tablets are of particular relevance, in addition to the physical quality parameters that apply to all tablets. Disintegration time with criteria that were faster than normal tablets, tablet wetting time, water absorption ratio, drug release, and flavor were the factors that were focused on while developing FDT excipients [22, 23]. The intended quality metrics, as well as the qualities of additives that affected these parameters, such as disintegrants and sweeteners, might be studied. The disintegrant material employed in FDT might be either a mixture or a super disintegrant [24].
Experimental designs that have been used for the development of FDT excipients include factorial designs [22, 23, 25], central composite design [1, 26], Box-Behnken design [27, 28], simplex lattice design [19, 20], simplex centroid design [29].

Effervescent tablets are tablet preparations that release CO2 when NaHCO3 reacts with organic acids, allowing them to disintegrate and disperse quickly in water. This medication was created for individuals who have trouble swallowing tablets, such as the elderly and children, as well as those who have dysphagia. Preparation was also produced to improve the therapeutic impact [30, 31].

Effervescent preparations, in addition to having physical quality parameters such as tablets in general, must also have a taste that is acceptable to the patient. In addition, foaming time, CO2 content, and pH are also important parameters in the development of effervescent preparations. Thus, formulation attributes that are important to maintaining these quality parameters are sweeteners and the combination of NaHCO3 and organic acids [31].

The experimental design approach to the development of effervescent preparations is still limited. Studies that have been reported have demonstrated the use of factorial and central composite designs [30–32].

Tablet oral mucoadhesive

Bioadhesives, or surfaces that can link to a biological surface, such as the mucosa around the mouth, are produced by excipients in mucoadhesive oral tablets, allowing the preparation to stick in the mouth. The two varieties of this preparation are buccal tablets, which are connected to the mucosa of the cheek area, and sublingual tablets, which are attached to the area under the tongue. The medicine is released into the mouth for rapid absorption through the permeable blood vessels surrounding the oral mucosa, avoiding gastric acid destruction and first-pass effects in the liver. The most prevalent medications produced in this procedure are peptide drugs. Usually, the drugs made in this preparation are peptide drugs. In addition, this preparation can be intended also to provide a local effect on the mouth [33, 34].

Modified release tablet

Excipients in modified-release tablets have the ability to hold the drug in such a way that its release can be controlled. This preparation is intended to increase the duration of action of the drug and reduce toxicity. Several excipients have been developed: hydrophilic excipients and osmotic pore excipients [48–50].

Gastroretentive tablet

Gastroretentive tablets can persist in the stomach. It was intended to increase the bioavailability of the drug in the stomach or maintain a local therapeutic effect on the stomach. There are several types of gastroretentive excipients: excipients that float in gastric fluid with low foaming or density mechanism, bioadhesive excipients, excipients that expand in gastric fluid, and excipients that sink in gastric fluid with a high-density mechanism. Several preparations with excipient combinations have also been developed [16, 27, 39–44].
The drug release profile is the typical quality parameter of this preparation because the objective of this excipient is to modify drug release. As a result, the elements that operate to contain the medication material are the formulation features that need to be adjusted. The formulation attribute for hydrophilic excipients is hydrophilic polymeric polymers. The formulation attribute for osmotic pore excipients is in situ pore-forming polymeric polymers [51–53]. The factorial design, central composite design, Box-Behnken design, and simplex centroid design have all been used in the creation of modified loose dosage forms [54–56].

**Colon targeted tablets**

Tablets that are colon-targeted do not break down in the digestive tract until they reach the small intestine. This formulation was designed to have a local therapeutic impact, similar to how antibiotics are used to treat infections of the large intestine. These formulations can be used to boost protein and peptide drug absorption [59, 60].

The ability of the dosage form to endure degradation in the gastrointestinal tract, the drug release profile in the large intestine, and the percentage of drug entrapment are all quality characteristics to consider in this preparation. Coating materials and hydrophilic polymer excipients are two formulation properties that must be maintained [61, 62]. The experimental designs that have been used, such as design factorial and central composite design [61, 62], are still limited.

**CONCLUSION**

The experimental design approach has become a new trend in the development of various tablet excipients. The various experimental designs, the factorial design is the most chosen because of its flexibility. In general, the development of effervescent, oral mucoadhesive, and colon targeted excipients, research with an experimental design approach is still limited to a small number of experiment design variations.

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All authors have contributed equally.

**CONFLICT OF INTERESTS**

Declared none

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