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ORIGINAL ARTICLE

Formulation and Evaluation of Amlodipine Besylate Tablet by Direct Compression Method

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Keywords: *Oral hypertensive agent, Amlodipine, formulation development, pharmaceutical grade excipients, pharmacopeial limits.*

Author`s Contribution
All the authors contributed significantly to the research that resulted in the submitted manuscripts.

Article info.
Received: October 10, 2017
Accepted: December 29, 2017

Funding Source: *Nil*
Conflict of Interest: *Nil*

Cite this article: *Alam MT, Alam S, Karim F, Naveed S, Qamar F, Sarwar G, Usmanghani K, Sadia H. Formulation and Evaluation of Amlodipine Besylate Tablet by Direct Compression Method. RADS J. Pharm. Pharm. Sci. 2017;5(4):57-61.*

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ABSTRACT

Background: Amlodipine is an antihypertensive agent usually used in all types of hypertension. The drug belongs to Calcium Channel Blockers. It inhibits the calcium influx through the cell membrane. Apart from hypertension, the drug is also beneficial in other heart ailments.
Objective: The purpose of the study is to formulate and evaluate Amolodipine Besylate prepared by direct compression method.
Methodology: Non-active ingredients were blended with the active and tablets were formulated using direct compression technique. The manufacturing formula contain Amlodipine besylate 10mg, microcrystalline cellulose, lactose anhydrous, sodium starch glycolate, cross carmellose. For evaluation in process and finished product tests were conducted. The tests include weight variation test, thickness test, hardness test, disintegration and as well as assay using UV spectrophotometer.
Result and Conclusion: The results of the newly formulated drug were found to be within the pharmacoepeial limits. Weight variation, disintegration test, thichkness test, hardness test, friability tests and assay all showed results in compliance with the BP/USP. Hence, concluded that amlodipine formulated via direct compression technique showed similar results to those formulated via granulation technique.

INTRODUCTION

Amlodipine besylate an anti-hypertenisve agent inhibits the calcium influx through cell membrane Amlodipine besylate is a potent long-acting calcium channel blocking agent [1,2]. It is most commonly prescribed drug for hypertension either primary or secondary[3]. Amlodipine belongs to dihydropyridines and has a large volume of distribution (21 L/Kg) [4,5]. Amlodipine is more successful than β-blockers in the management of angina [6,7]. Moreover, it blocks selectively the arterial vascular smooth muscle cell proliferation [8,9].

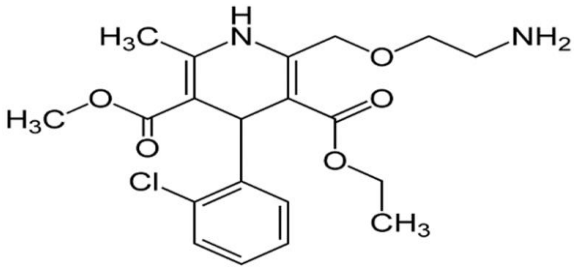

Figure 1. Structure of Amlodipine.

Amlodipine besylate is official in British Pharmacopoeia (BP) [10]. Structure of amlodipine besylate is shown in Figure **1**.

In all dosage form the most prescribed form is tablets and the most commonly employed manufacturing technique is direct compression method because it is less expensive and takes less time to manufacturing of tablets [11].

Technical persons are aware with different manufacturing method of tableting and they have an idea about the critical issues related to the tableting [12-13]. From all methods of manufacturing Direct compression method is very efficient in manufacturing of tablets as it does not requires pretreatment of the powder blends as mandatory in wet or dry granulation process [14]. Tablet production by direct compression involves only two operations in sequence, powder mixing and tablet manufacturing [15-17]. QC test during the manufacturing of the tablets becomes essential for the assurance that the tables do not vary from one production batch to another [18]. Weight variation test is used before a batch is released [19-20]. The thickness of the tablet is also assessed; tablet thickness from production to production run is measured and carefully precise [21-22]. Tablet should be hard enough to tolerate manufacturing, packaging plus conveyance. Conversely should not be too hard to amend disintegration as well as dissolution 23]. A tablet property associated to hardness of tablet is friability [24] The drug release process from a tablet include a step at which tablet disintegrate into fragments [25,26]. A tablet must comply all these tests before release into the market.

MATERIALS AND METHOD

An innovative formulation of amlodipine besylate was created and investigated for its pharmacopeial parameters. Formulation includes Amlodipine besylate 10mg, microcrystalline cellulose, lactose anhydrous, sodium starch glycolate, cross carmellose sodium. Different brands of amlodipine 10mg were obtained from the local market. The parameters for evaluation included the appearance of granules and tablets, weight variation test, statistical thickness test, statistical hardness test, friability by using fribilator, disintegration time, and pharmaceutical percent assay test. Reagent used in this study for performing the pharmaceutical assay was methanol (lab scan).

Preparation of granules and finished product

Preparation of powder granules including the mixing process in which lactose anhydrous , microcrystalline cellulose Ph 102 and cross carmellose sodium were mixed properly in a poly bag for almost 15 minutes. After thorough mixing, amlodipine besylate powder was added to the mixture and mixed well for 5 minutes. The mixture along with the active ingredient was passed through a 16 mesh sieve. Magnesium stearate was slowly added and was mixed again for 2 minutes. At this point, the granules were obtained for assay. After obtaining satisfactory results, the granules were compressed into tablets. The prepared tablets were evaluated for pharmacoepeial and non-pharmacoepeial tests. The percentage composition of new formulation is shown in Table **1**.

Methods of analysis of amlodipine besylate tablets

QC parameters during the manufacturing of the tablets becomes essential for the declaration that the tables do not vary from one production batch to another. The specification of tablets includes the following [18].

Weight variation test

Average tablet weight was determined by weighing 20 units or tablets individually by means of an analytical balance for weight variation test. The mean weight of the tablets was recorded with the individual weight results.

Thickness test

Twenty tablets were taken and their thickness was determined individually by means of vernier caliper and their mean was recorded for average thickness test determination.

Hardness test

Twenty tablets were taken arbitrarily and hardness was calculated using Hardness Tester. The mean of 20 tablets of formulations and brands formulation were recorded.

Friability test

Twenty tablets were taken randomly and were weigh on a balance. After weighing the tablets were placed in fribilator and were rotated for 100 times for 4 minutes. After completion of time weigh the tablets and estimate the percentage of before and after.

Disintegration test

Disintegration time was calculated for 6 tablets by means of inserting the disks using 900 ml purified water at 37±2ºC in Disintegration Apparatus. Disintegration time was recorded for the tablets.

Assay of amlodipine besylate tablets by UV spectrophotometer

Assay and test procedures are provided for determining compliance with the Pharmacopeial standards of identity, strength, quality, and purity. Amlodipine Besylate Tablets containing NLT 90% and NMT 110% of the labeled amount of amlodipine 10 mg of Standard amlodipine besylate USP (Batch number 038-07- 2015-AB) was weighed and dissolved in 50 ml volumetric flask and the volume was made up. Then 10 ml was taken in another 50 ml volumetric flask and the volume was made-up to 50 ml and mixed well. 20 tablets were sampled and their average weight was taken which was equal to the 160 mg ,and their solution was prepared in the same way. The diluent used was methanol for standard and samples. The absorbance was measured at the wavelength of 360 nm.

RESULTS AND DISCUSSION

A new formulation of amlodipine besylate was developed by direct compression method. The newly formulated amlodipine besylate was of 10 mg potency. The brands obtained for comparision with the newly formulated drug were also of 10mg. Before compression granules were obtained for assay by UV spectrophotometer. The results for granule assay are shown in Table **2**. Different pharmacopeial parameters like weight variations test, hardness test, friability, disintegration test, assay and content uniformity test were evaluated and results of new formulation were recorded in Table **3**. By evaluating the weight variation test we recorded the average weight of new formulation of amlodipine tablet was found to be 162.98 mg / tablet, hardness 5.85 kg, thickness 2.9 mm, friability 0.257% and disintegration time of all 20 tablets was found to be 6 minutes and all physical parameters came out to be within the specification of BP/USP. Pharmaceutical assay was performed by UV spectrophotometer. Percent assay of the formulated drug was calculated to be 98.05% while the content uniformity was 103.01%. Results are shown in Table **3**.

Table 1. New formulation of Amlodipine Besylate 10 mg tablet and percentage composition of formulation.

S.No.	Ingredients	Percentage Composition / Tablet (%)
1	Amlodipine Besylate	9.08
2	Lactose Anhydrous	37.5
3	Microcrystalline Cellulose Ph 102	47.16
4	Cross Carmellose Sodium	5.0
5	Magnesium Stearate	1.25

Table 2. Pharmaceutical assay results of granules.

S.No.	Percent Assay Results %
Sample 1 (Granules)	98.6
Sample 2 (Granules)	97.5

Table 3. Evaluation of new formulation of amlodipine besylate 10 mg tablet by different parameters and other available brands.

Parameters	New Formulation	Formulation 1	Formulation 2
Thickness (mm) (n=20)	2.9 mm	2.5mm	2.3
Hardness (kg) (n=20)	5.85kg	6.0 kg	8.0
Weight (mg) (n=20)	162.98mg	155.50 mg	152.8
Friability (%) (n=20)	0.257%	0.406%	0.350%
Disintegration (minutes) (n=6)	6 minutes	8 minutes	7 minutes
% Assay (n=2)	98.05%	96.50%	98.0%
Content Uniformity in % (n=10)	103.01%	98.9%	96.0%

CONCLUSION

Comparing the new formulation of oral antihypertensive agent amlodipine tablets with other formulation (brands) available in market we concluded that direct compression methods is a conventional method and tablets formulated by this method show satisfactory result. A number of research articles are accessible which are understandable that the direct compression is a preferred method of tableting and by comparing all parameters and their results viewing that optimization method is a high-quality tool for preparing improved quality of dosage forms [28]. Hence, concluded that amlodipine formulated via direct compression technique showed similar results to those formulated via granulation technique.

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