



## THE EFFECT OF DIFFERENT EXCIPIENT FORMULATION ON THE RESULTS OF THE PHYSICAL EVALUATION OF AMOXICILIN CAPSULES

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### Abstract

*The use of capsules in Indonesian society is quite widely used because they only have attractive shapes and colors. Capsules are considered to help patients who do not take medicine because the taste of the medicine is not good or tends to be bitter. In this study, researchers tried to make two formulations to compare the effect of differences in the percentage of PVP on the results of the physical preparation evaluation test of amoxicillin capsules. The evaluation tests carried out included tests of flow properties, angle of repose, compressibility test, weight uniformity test, disintegration time test, and capsule size uniformity test. The results of the evaluation test on the evaluation of amoxicillin showed that both formulations still met the requirements.*

**Keywords :** Capsule, Formulation, Excipient, Amoxicillin

### INTRODUCTION

The phenomenon of the use of capsule preparations in Indonesian society is quite widely used. Apart from having an attractive shape from a variety of capsule shell colors, capsules are considered to be preferred because of the bitter taste of the drug. One example of amoxicillin is an antibiotic that is quite widely used in medicine but has a somewhat bitter taste, so the preparation of amoxicillin capsules can improve the taste of amoxicillin itself.

Capsules are medicinal preparations that are enclosed in a capsule shell, generally intended for oral use. The capsule shell can be made of gelatin or cellulose. Capsules have various sizes, depending on the intended use. There are hard capsules and soft capsules in the market. The difference between the two is only based on the contents and shell of the capsule. Hard capsules are made from hard gelatin and contain solid ingredients, while soft capsules are made from soft gelatin or cellulose with an oily liquid content. Capsules are solid preparations which consists of hard or soft shell drugs which are soluble, the shell is generally made of gelatin but can also be starch or other ingredients that in accordance (Depkes RI, 1995a).

Hard capsule formulations are generally the same as tablet formulations, the difference is that in the manufacture of hard capsules the material which is already in the form of granules or powders, the dosage mass is inserted into a suitable shell. Furthermore, the filled capsules are cleaned and if necessary sealed so that the capsules do not leak. After passing the quality test or after being evaluated, it can be inserted into suitable packaging (Ansel HC, 1998).

Before filling into the capsule shell, the most important thing is to test the flow properties and compressibility of the powder or granule mass. It is also necessary to test the capacity of the capsule shell, so that the contents of the capsule obtained are in accordance with the desired dose.

Excipients are often referred to as additional ingredients in drugs. The addition of excipients in pharmaceutical preparations is intended to form drug preparations because the active drug ingredients cannot be given to patients without additional components or excipients. In manufacturing granules, it is necessary to add excipients to meet the formulation requirements, including binders. One of the binders that are often used is polyvinyl pyrrolidone (PVP). Granules with PVP binder have good flow properties and minimum angle of repose.



This study aimed to determine how much influence the concentration of excipients had on the physical properties of the capsules made.

This research that we are currently making, races on previous articles, but in this study, an update of the active substance used was carried out whereas in previous research the active ingredient from the extract was used (Wulandari, 2021). besides that, the researcher also developed an evaluation test that was carried out (Oktadiana, 2022), and it is hoped that the changes that the researcher made will become a reference for further researchers in making even better research.

## METHOD

The method used in this study is an experimental study by making granules with other PVP 5% and 10% as binders. Then the granule test and physical evaluation of the capsule were carried out to find a better formulation. Tools and materials used to manufacture amoxicillin capsules include analytical balance, mortar, stemper, parchment paper and sieve No. 14. The ingredients used in this study were Amoxicillin, Aerosil, PVP, Avicel and Lactose.

The procedure for making Amoxicillin capsules is all required ingredients are weighed according to the predetermined Formulation (Formula 1 and 2). In the manufacture of amoxicillin capsules using the dry granulation method for all ingredients before being put into the capsule shell, all ingredients such as Amoxicillin, Aerosil, PVP, Avicel and Lactose into a mortar and stir until homogeneous. Then all ingredients are mixed and homogeneous. Then the components are sieved using sieve No. 14. After that, the sifted powder is tested before being put into the capsule shell. After completion of the flow properties test, angle of repose and compressibility test of powder or granule then put into the capsule shell. Furthermore, after all the granules enter the capsule shell, the capsules are tested for uniformity of capsule weight, disintegration time, and capsule size.

**Table.1 Amoxicillin Capsule Formulation Variations**

NO	MATERIAL NAME	FORMULA 1	FORMULA 2
1	Amoxicillin	500 mg	500 mg
2	Aerosil	2 %	2 %
3	PVP	5 %	10 %
4	Avicel	10 %	10 %
5	Lactosa	Ad 100 %	Ad 100 %

Amoxicillin capsule physical properties evaluation test consists of:

### a. Granule Flow Properties Test

The flow test is carried out by weighing 20 grams of granules, which are then placed on the funnel of the flow time test instrument in a closed state. Open the lid and let all the granules drain, then record the time. Requirements: Granules have good flow properties if they have a flow time of not less than 10 seconds. A mixture of granules is said to have good flow properties if the flow rate is not less than 10 g/second (Depkes RI, 1979a).

### b. Still Angle

Angle of repose is a fixed angle that occurs in a conical heap of particleboard with a horizontal plane. To obtain the angle of repose we can calculate it by weighing 20 grams of granules placed in the funnel of the tool to test the flow time, only here we calculate the diameter and height of the granules when all the granules have flowed completely from the flow test apparatus, we can calculate the height and diameter of the granules. use a caliper. The formula that we can use to determine the angle of repose is:

$$\tan \alpha = \frac{h}{r}$$

Description:



Tan  $\alpha$  : angle of repose  
 h : height of granule  
 r : radius (1/2 diameter of granule)

#### c. Compressibility Test

The granule compressibility test is carried out by weighing 20 grams of granules and then putting them in a glass put into a glass in the Jouling tester (tapped density tester) record the height of the granules ( $V_0$ ) then adjust the use of the tool for 15 minutes, after 15 minutes observe the height of the granules ( $V_n$ ) then we calculate the percentage of granule compressibility. The percentage of granules is calculated using the equation:

$$I = \frac{V_0 - V_1}{V_0} \times 100 \%$$

Description:

I : % compressibility  
 $V_0$  : Initial height  
 $V_1$  : High after test

#### d. Capsule Weight Uniformity Test

Weigh 20 tablets one by one, then calculate the average weight of each capsule. Requirements: There must be no more than 2 capsules whose weight deviation from the average weight is greater than the price set in column A and or none of the capsules whose weight deviates from the average weight is greater than the price set in column B.(Depkes RI, 1979b)

#### e. Disintegration Test

Six capsules were put into a basket-shaped tube on the disintegrator tester, then set the time for 20 minutes, with a water temperature of 37°C according to body temperature. Then start the machine and let the basket rise and fall regularly and continuously for 20 minutes, observing how many minutes the capsules disintegrate completely. Capsules can be declared destroyed if there are no more parts of the capsule left on the gauze (basket). The capsule disintegration time test requirement is less than 15 minutes.(Depkes RI, 1979a)

#### f. Uniformity Test of Capsule Size

The size uniformity test was carried out using all capsules in each formulation using a caliper.(Depkes RI, 1995c)

## RESULTS AND DISCUSSION

Capsules are solid preparations consisting of soluble hard or soft shell drugs, generally the shell is made of gelatin but can also be made of starch or other suitable materials. The purpose of making capsules using the dry granulation method before being put into the capsule shell is to improve the flow properties of the substance so that it will improve the disintegration time of the drug mixture in the capsule shell.

The granule formulations were made in two formulations with the same weight for the main substance and different weights on the excipient substance, this aims to compare the effect of the additive on the physical properties of the two capsules with different excipient formulations, and which of the two formulations that meet the requirements of several predetermined tests. From the results of the evaluation of physical properties that have been carried out, the results obtained are:

#### a. Granule Flow Properties Test

In carrying out the flow test on materials that have been mixed with the dry granulation method, the following results are obtained:

**Table.2 Results of Evaluation of Flow Properties**

Formula	Flow Time
1	50 gram/second



2

37,73 gram/second

Based on the results on the table.2 obtained the two formulas that students have met the requirements that have been set, where the flow time is one of the important factors in the manufacture of granules because in a good flow time will ensure uniformity of weight. In 100 gram granules a good flow time has the properties of a flow time of 10 seconds or a flow rate of 10 gram/second.(Fudholi, 1983)

#### b. Still Angle

In the evaluation of the angle of repose, the following results were obtained:

**Table.3 Results of Evaluation Still Angle**

Formula	Still Angle
1	12,95°
2	11,31°

Based on the data on table.3 obtained from the evaluation of the angle of repose in the table above, the 2 granule formulas have met the requirements for the angle of repose. Because the angle of repose value  $\leq 25^\circ$  generally indicates free-flowing granules, and angle of repose  $\geq 40^\circ$  indicates granules have poor flow.(Banker, G.S, 1994)

#### c. Compressibility Test

The results obtained from the compressibility evaluation are as follows:

**Table. 4 Compressibility Test Evaluation Results**

Formula	Compressibility (%)
1	32,5
2	33,34
Average	32,93

Based on the results on the table.4 of the average compressibility test obtained, which is 32.93%, it can be said that the granules are considered quite good, even though they do not meet the required requirements. Where a compressibility index value of less than 10% indicates a very good flow while a compressibility index value of more than 38% indicates a very poor flow.(Shah, 2014)

#### d. Capsule Weight Uniformity Test

The weight uniformity test was carried out by weighing 20 capsules of each formula, weighing again one by one, removing the contents of all capsules, weighing all parts of the capsule shell. Calculate the weight of the capsule contents and the average weight of each capsule contents.

The results obtained are as follows:

**Table.5 Results of the Capsule Weight Uniformity Evaluation Test**

Formula	Deviation (%)
1	2 capsules deviated from column A (7.5%) And none deviated from column B (15 %)
2	2 capsules deviated from column A (7.5%) And none deviated from column B (15 %)

Based on the data obtained in the table.5 on the capsule preparations made, the deviation results do not exceed the established standards where for capsule weights more than 120 mg the deviation limits are  $A \pm 7.5\%$  and  $B \pm 15\%$ .

#### e. Disintegration Test

Disintegration time test is used to test hard and soft capsules. Disintegration time is determined to determine the time required by the capsule in question to disintegrate into free granules that are not bound by one form. According to FI IV, to perform the disintegration time test, a tool known as the Disintegration Tester was used. The test was carried out by testing



each of 6 capsules of each formula, using a disintegrator tester and setting it at 37° C (according to human body temperature) and testing for 20 minutes. The results obtained are as follows:

**Table.6 Results of Disintegration Test**

Formula	Time
1	12 minutes
2	14 minutes

Based on the results of the disintegration time test obtained in the table.6 above where formula 1 disintegrates in 12 minutes and formula 2 disintegrates at 14 minutes, this indicates that these two formulas meet the standard disintegration time test. This is the same as that stated in the Indonesian Pharmacopoeia III edition, unless stated otherwise the disintegration time of the capsule is not more than 15 minutes.(Depkes RI, 1995b)

#### **f. Uniformity Test of Capsule Size**

This test is carried out by measuring the length of the capsule in each formula, where each capsule is measured using a ruler to determine the suitability of the capsule length, while the results obtained from this test include:

**Table.7 Results of Uniformity Test of Capsule Size**

Formula	Capsule Length	Deviation
1	49 capsules 2 cm long 1 capsule 1.9 cm long	1 capsule deviated due to imperfect capsule shape
2	50 capsules 2 cm long	No capsule size deviation

Based on the data from table.7, it was found that in formula 1 obtained 1 capsule whose length was deviated, namely 1.9 cm this was due to the capsule cap not being perfectly shaped (there was damage) this could be due to an error when installing the capsule cap. As for formula 2, all capsules have a uniform capsule length of 2 cm.

## **CONCLUSIONS**

Based on the results of the research conducted, in the manufacture of Amoxycillin capsules using the dry granulation method with variations in the levels of PVP binder has good flow properties, minimum angle of repose, suitable granule compressibility, good weight uniformity, good disintegration time and capsule size uniformity are pretty good.

Further research is needed to make Amoxycillin capsules with a combination of PVP levels and pay attention to hygroscopic components because they will affect the stability of the preparation.

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