[HP#66]

Formulation of Granules Effervescent from Avocado Seeds by Vary Concentration of Acid and Base

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ABSTRACT

Avocado (*Persea americana* Mill) is a fruit that is commonly consumed because of its good taste. Not only fruit but also avocado seeds also have a variety of benefits, one of the active substances in avocado seeds is Omega-3. The polyphenolic compounds used during the manufacture of avocado seed granules with acid and base differences with a ratio of citric acid, tartaric acid, and sodium bicarbonate consumers need an easy way to consume these plants. The purpose of this study developed innovation as food supplements. This study used an experimental method toward different concentrations of avocado seeds: 15 gram (F1), 20 gram (F2), and 32 gram (F3), with three replicates, the comparison of the concentrations of citric acid, tartaric acid, and sodium bicarbonate (1: 2: 3, respectively). The data were obtained by applying the Oneway Anova method with the posthoc test. Based on research and tests that have been carried out include the physical test. Formulation III was the best effervescent granules of avocado seeds, with a water content of 5%; angle of repose 0.44°; flow rate 0.13 g/s; specific gravity 0.53; soluble time 60.3 seconds; and pH 3 (sour taste).

Keywords: Avocado seeds; Granules effervescent; Wet granulation

1 Introduction

Memory decline in humans aged 6 years and over worldwide occurs around 5-7%. In 2010 there were 58% of dementia patients living in countries with low or middle income and is expected to increase to 63% in 2030 and 71% in 2050 [1]. Prevention efforts need to be done so that this memory loss does not occur continuously. One way to do this is to eat avocado seeds. Avocado seeds (*Persea americana* Mill.) are rich in omega-3 fatty acids which are good for improving memory. Omega-3 compounds are unsaturated fatty acids that have a double bond, the first of which is located on the third carbon atom of the omega methyl group. Omega-3 is an essential fatty acid for the body that can be obtained from animal and vegetable foodstuffs. An example of omega-3 fatty acids is alpha-linolenic acid (ALA) which can be converted to eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) [2,3].

In line with the development of science and changes in lifestyle today, there are consumer demands for plant materials that are not only limited to a food source but are also able to provide benefits to the health of the human body. Consumers need an easy way to consume

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these plants. One of them is by making effervescent powder formulations. Effervescent powders are coarse to very coarse powders containing active compounds in a mixture that have a dry texture. The ingredients for making this formulation usually consist of sodium bicarbonate, nitric acid, and tartaric acid which, when added to water, the acid and base contents react to liberate carbon dioxide to produce foam [4]. The resulting carbonate solution can mask the bitter taste or other unwanted flavors of the active ingredients added, as well as give a sparkle effect or taste like consuming soft drinks [5].

Based on the description above, this study aimed to make an effervescent formulation with the active ingredient avocado seed extract with a variety of acids and bases as a supplement to improve memory.

2 Materials and Methods

2.1 Extraction

Avocado seed was extracted by soxhlation. 20 grams of avocado seed powder was dissolved in 250 ml of n-hexane for 4 hours for 5 cycles at room temperature protected from sunlight. The extract results were evaporated using a rotary evaporator and a water bath at 68°C until a thick extract was obtained. The thick extract was mixed with aerosol in a 1:2 ratio to get the dry extract.

2.2 Making granules effervescent

The effervescent granule formulations (F1-F3) in this study were shown in Table 1.

Table 1: *Formulation of effervescent*

Material	Formulation		
	F1 (g)	F2 (g)	F3 (g)
Extract of Avocado seed	15	15	15
PVP	2	2	2
Sodium bicarbonate	3.75	2.68	2.10
Citric acid	0.57	1.71	2.28
Tartaric acid	1.68	1.68	1.68
Sucrose	5	5	5

The materials were mixed then effervescent granules were put into the oven at 50°C for drying. Furthermore, the dry granule was grinding and sifting stages using a mesh sieve no. 44.

2.3 Evaluation of effervescent granules

Evaluations of effervescent granules were conducted by organoleptic test, moisture test, angle of repose test, flow speed test, specific gravity test, soluble time test, and pH test.

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3 Results

3.1 Result of organoleptic test

Table 2 presents result of organoleptic test granules.

Table 2: *Result of organoleptic test granules*

Formulation	Color	Smell	Flavour
F1	Pale yellow	Avocado seeds specifically	Tasteless
F2	Pale yellow	Avocado seeds specifically	Slightly sour
F3	Brownish yellow	Avocado seeds specifically	Sour and slightly sweet taste

3.2 Result of evaluations of effervescent granules

The evaluations of effervescent granules are shown in Table 3.

Table 3: Evaluations of effervescent granules

Test	F1	F2	F3
Moisture content (%)	6.33	5.43	5.00
Angle of repose (°)	0.42	0.27	0.44
Flow rate (g/s)	0.15	0.09	0.13
Specific gravity	0.36	0.70	0.53
Soluble time (s)	83.6	96.6	60.3
pH	7	5	3

4 Discussion

4.1 Organoleptic test

The organoleptic test results showed that the F3 effervescent granule formulation had a sour and slightly sweet taste, in contrast to the other formulations which tasted tasteless and slightly sour. The taste of effervescent granules is influenced by a combination of citric acid and tartaric acid as a source of acid. Citric acid tends to have a more acidic pH than tartaric acid so F3 has a more prominent sour taste and can cover the bitter taste of avocado seed extract.

4.2 Moisture content test

The requirements for a good effervescent granule water content are 1-5% in the formulation. The results of the moisture content test showed that the F3 effervescent granules had a moisture content of 5% (according to the standard), while the F1 and F2 preparations had a moisture content of more than 5%. The formulation that has the least water content is F3 with citric acid: tartaric acid ratio of 2:2. The water content in the effervescent formulation can bind the base which causes high humidity. The higher moisture content generates damage to the granules when stored at high temperatures.

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4.3 Angle of repose test

A good granule has a repose angle of 25°- 45°. There were differences in the angle of repose of the three formulations due to the acids and bases used. The less acid and base added, the friction between the particles in the granules is also low. Although statistically (Kruskall Wallis test), the effect of differences in acids and bases used in each preparation was not significant to the angle of repose of the preparation ($p > 0.05$). The smallest angle of repose in the effervescent granule preparation, namely the F2 preparation, was 0.27° using a ratio of citric acid: tartaric acid (2:2). The angle of inactivity of the effervescent granule of avocado seed extract showed excellent flow. The smaller effervescent granule size caused the greater angle of repose and the longer flow time.

4.4 Flow rate test

The standard flow time for good granules is that every 100 grams of preparation has a flow time of 10 seconds [6]. Granules that have speeds of more than 10 seconds can affect the uniformity of the dosage weight. Effervescent granules that have been made on F1, F2 and F3 have different average flow times. The flow rate test results of the three formulas had a low speed except for F2 with a flow rate of 0.09 seconds. The flow rate in granule preparations is influenced by the amount of tartaric acid used in the formula. Even though the effect of adding the acid was statistically (Kruskall Wallis test) not significant ($p>0.05$). In addition, the added sucrose can also affect the flow properties of the preparation. The content of the active ingredients also affects the flow properties because the active ingredients are in the form of dry extracts (thick extracts + aerosols).

4.5 Specific gravity test

Specific gravity test results for all granule formulations varied. The tap index is the percent effect of the granules after being determined. The results obtained were F1, namely 1.09 g/ml with an index tap of 0.36%. This presented that F1 has the tap index with good standard conditions from the specific gravity test (<20%). The addition of acids and bases to each formulation statistically (Kruskall Wallis test) influenced the specific gravity of the preparations although not significant ($p>0.05$). The difference in specific gravity in each formulation was probably due to the different sizes of the granule particles, which caused the empty spaces between the different particles to exist.

4.6 Soluble time test

Good effervescent granules will dissolve quickly within 1-2 minutes. The dissolution process will be complete if it is marked by the cessation of CO_2 gas production in the water. The release of CO_2 gas requires acidic compounds and sodium bicarbonate as a base source. The best dissolving time value was obtained from the F3 effervescent granule with a time of 60.3 seconds. The high sodium bicarbonate content can provide a very good dissolving speed

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compared to other formulas. Sodium bicarbonate has a function as a disintegrating agent so that it can accelerate the solubility of effervescent granules. The gas produced from carbon dioxide serves as a disintegrant for effervescent granules.

4.7 pH test

pH is a parameter that states the level of acidity of a substance. pH observations were carried out to determine the acidity of the effervescent preparation of avocado seed extract. Effervescent granules have good acidity if pH < 7 [7]. The pH test of effervescent granules on F1 and F2 met the requirements, which was less than 7. One of the factors that could affect the pH value of the preparation was the formation of CO_2 during the effervescent reaction in water which partially dissolved to form carbonic acid. This carbonic acid then decomposes and produces H^+ ions in solution which can cause an increase in the acidity of the preparation. The addition of acids and bases to each formulation statistically (Kruskall Wallis test) has a significant effect ($p < 0.05$).

5 Conclusion

Avocado seed extract can be formulated into effervescent granules. The formulation of F3 was selected. It reached the effervescent granule formulation standards with a water content of 5%; angle of repose 0.44°; flow rate 0.13 g/s; specific gravity 0.53%; dissolving time 60.3 seconds; and pH 3 (sour taste).

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