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Test Content Calcium Carbonate ($CaCO_3$) On The Shell Of The Golden Snail (*Pomaceae Canaliculata*) As Anticide Substance

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Abstract

Antacids are weak bases that are used to treat gastrointestinal conditions caused by increased gastric acid secretion. Calcium carbonate is a common antacid (CaCO3). As is well known, the golden snail shell is almost entirely composed of calcium carbonate. As such, we tested the calcium carbonate (CaCO3) content in the shell of the golden snail (Pomaceae canaliculata) as an antacid substance in this study. The study was conducted empirically in four stages: preparation, XRF test, XRD test, and antacid simulation test. As a result, the golden snail's shell (Pomaceae canaliculata) contains up to 50.4161% calcium oxide (CaO), which has the potential to be used as a starting material for calcium carbonate extraction (CaCO3). The XRD diffractogram at 500°C shows that pure CaCO3 was produced with a typical diffraction pattern at 2θ: 26.16° and 27.12°. Additionally, it is well established that the calcium carbonate (CaCO3) found in gold snail shells can neutralize acid. However, additional research on the use of calcium carbonate in golden snail shells (Pomaceae canaliculata) as an antacid is necessary to determine the optimal dose for successful stomach acid neutralization.

Introduction

Antacids are compounds that can neutralize or bind gastric acid (Rahardianti, 2010). This compound is frequently prescribed as a treatment for ulcer disease or gastritis (inflammation of the stomach). Antacids work by neutralizing stomach acid and inactivating pepsin, hence neutralizing discomfort caused by stomach acid and pepsin irritation. According to Gunawan (in Nazamain, 2019), the antacid group of chemicals comprises aluminum, magnesium, sodium bicarbonate, and calcium carbonate.

Calcium carbonate is a common antacid. Calcium carbonate is a chemical substance with the formula CaCO3 that is common in rocks worldwide. It is the primary component of marine organisms, charcoal ball snails, pearls, and eggshells (Nugraha & Kadir, 2019). Calcium carbonate (CaCO3) can neutralize acids, which are used as an antacid in the pharmaceutical industry (Van Hoten, 2017). Calcium carbonate was the first ulcer medicine to be used as an antacid, and it has proven to be extremely successful (Nazamain, 2019).

Many ingredients containing a high concentration of calcium carbonate have been tested for their efficacy as gastric antacids. One of these is a study by Izzaturrohmah et al., in which eggshell waste is converted into an antacid. Antacids containing 12405 mg of activated calcium carbonate derived from eggshells have been shown in these tests to successfully reduce stomach acid.

The author attempted to evaluate additional materials with a similar calcium carbonate content as antacids. The golden snail shell will be used as the test material. The golden snail (*Pomaceae canaliculata*) is a mollusk with a soft body and a hard shell (Islami & Anita, 2015). In Indonesia, the gold snail population is extremely prolific and is frequently encountered as a pest in rice fields. Gold snail meat is widely used as

animal feed and a source of animal protein in human diets. The shell, on the other hand, is underutilized and considered waste. While the various mineral contents of the golden snail shell can be investigated further in order to determine its suitability for application.

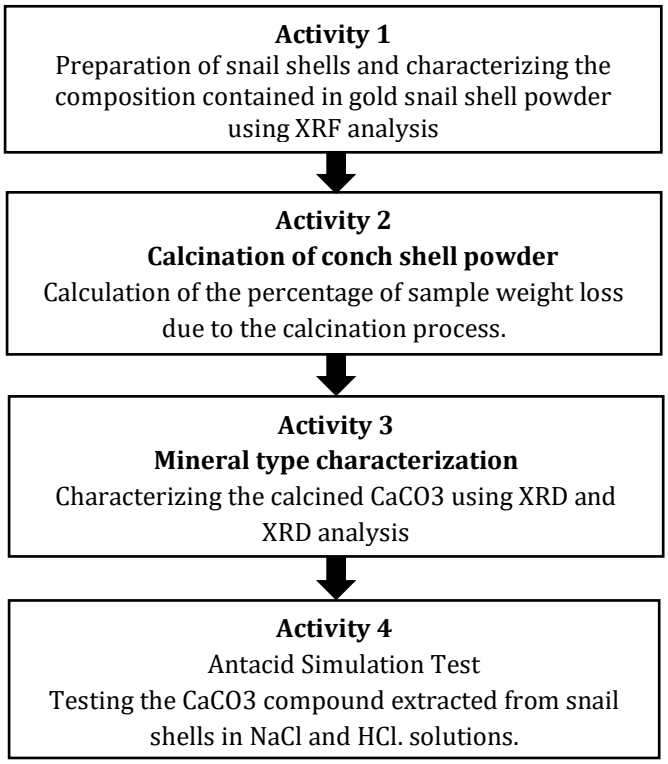
According to Gosu (Mauriza, 2019), the golden snail shell comprises calcium carbonate, calcium phosphate, silicate, magnesium carbonate, and phosphorus compounds. The calcium carbonate content of gold snail shells is nearly identical to that of other mollusks. The golden snail shell is almost entirely composed of calcium carbonate (Nopriansyah et al, 2013). The high content of calcium carbonate can be used as an antacid (gastric medicine). The calcium carbonate found in the gold snail shell can be extracted through a series of processing stages. As a result of the foregoing, the authors are interested in further testing the possibility for calcium carbonate (CaCO3) to act as an antacid substance in the shell of the golden snail (*Pomaceae canaliculata*).

According to the problem formulation, the purpose of this study was to determine the calcium carbonate (CaCO3) content in the shell of the golden snail (*Pomaceae canaliculata*) as an antacid substance

Methods

The research method used is experimental. The purpose of this study is to examine the calcium carbonate (CaCO3) content in the shell of the golden snail (*Pomaceae canaliculata*) as an antacid. The study was empirical in nature. The golden snail shell, which is high in calcium carbonate (CaCO3), is powdered and tested for its antacid properties. Three stages can be followed to obtain the calcium carbonate content of mollusk shells: preparation of snail shells, calcination of snail shell powder, mineral type characterization (Hariyati & Wibowo, 2019), and the antacid simulation test stage.

Research Stages:



1) **Snail shell preparation**
   The snail shells were washed with running water and then dried in the sun according to the procedure proposed by Fadhilah et al (2015). The shells were then crushed using a ball mill to achieve a fine size and powder form. To extract small and uniform particles from the powder, it was sieved using a 150 mesh sieve and then examined using XRF.
2) **Calcination of snail shell powder**
   After that, the snail shell powder was calcined for 4 hours at a temperature of 500°C to form CaCO3 compounds. XRD was used to characterize calcined CaCO3. The following step is to calculate the percentage of sample weight lost throughout the calcination process.
3) **Mineral type characterization**

X- X-ray Diffraction (XRD) is a critical method used to analyze crystalline solids. XRD is a method for identifying the primary properties of crystals. The existence of a root indicates the presence of a crystalline phase. Diffraction with a typical k-peak. Calcium carbonate (CaCO3) has the maximum peak intensity at 2θ = 29.5°. (Khiri et al., 2016). The gold snail shell's XRD pattern revealed the presence of the majority of calcium carbonate (CaCO3) crystallites upon activation at 400°C.

4) Antacid simulation test

The antacid simulation test was conducted in stages using a solution of NaCl and HCl in CO2-free water to achieve a pH of 1.3. (according to USP). The calcium carbonate compound extracted from the snail shell was then evaluated for its capacity to neutralize acid using NaCl and HCl solutions. (Rahardianti, 2010).

Results and Discussion

The research activities have reached the final stage, which is the simulation of gold snail shell powder being tested as an antacid substance. The activity begins with the preparation of snail shells, which are washed under running water until all dirt is removed and then dried. After drying, the snail shells were crushed to a coarse powder using a mortar and pestle. The coarse powder is then finely ground by ball milling to make a powder. The golden snail shell powder was crushed and then sieved through a 150 mesh sieve. Grinding and sifting are used to increase the surface area and uniformity of the powder. The refined and sifted snail shells produced a white fine powder that was further characterized by XRF. The composition of the golden snail shell powder was analyzed using XRF analysis. The results indicated that the golden snail shell contained 36,0245 percent calcium (Ca) and 50,4161 percent calcium oxide (CaO). Delvita (2015) discovered that calcium oxide (CaO) levels were 56.03 %. This significant disparity is the result of sample conditions (age, climate) and sampling locations. Table 1 shows the findings of XRF analysis on the shell in the oxide form before to calcination.

Table 1. Compotition of golden snail shell from XRF

Content (oxide)	Composition (%)
Al_2O_3	0.1187
SiO_2	0.6548
P_2O_5	0.0905
SO_3	0.0419
K_2O	0.0516
CaO	50.4161
Fe_2O_3	0.1821
SrO	0.0985
ZrO_2	0.0132
Balance	48.3324

After the preparation process is complete, XRD analysis is performed to determine the composition of the material generated on the snail shell. At this point, a sample of sifted snail shell powder was calcined for 4 hours at 500°C and then characterized using XRD.

Table 2. HAp X-Ray Diffractogram Peaks

Peak diffractogram at calcination temperature 500°C	
2θ (deg)	Representation
26,16	$CaCO_3$
27,12	$CaCO_3$

X-ray diffraction (XRD) analysis of snail shell samples extracted at a calcination temperature of 500°C revealed an overall diffractogram of peaks corresponding to phases of CaCO3. The diffraction pattern obtained in the table shows that CaCO3 occurs at 2θ: 26.16°, and 27.12°. Additionally, it was discovered during the analysis that the CaCO3 present in the golden snail shell was in the form of aragonite.

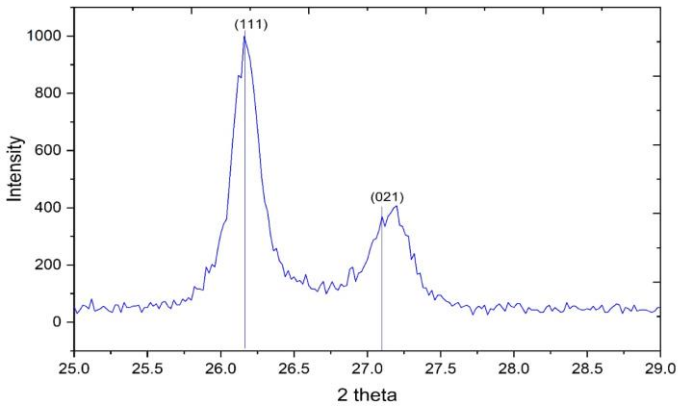


Figure 1. The results of XRD diffractogram of snail shell powder after calcination at a temperature of 500°C

The final stage was conducting an antacid test on gold snail powder to determine the calcium carbonate's ability to neutralize acid. The antacid test was carried out by making a solution of NaCL and HCL in CO2-free water to form a pH of 1.3. Previously, calcium in the snail shells that have been smooth and sieved with a 150 mesh sieve. To determine the efficiency of the prepared preparations, a simulation test was conducted by mixing the prepared preparations into an acid solution with a pH of 1.3 previously. As a result, it is believed that the calcium carbonate (CaCO3) found in snail shells can neutralize acids. However, calcium carbonate (CaCO3) in golden snail shells requires further research before it can be used as an antacid. Particularly regarding the proper dosage to ensure that it is effective as a stomach acid neutralizer.

Conclusions and Recommendations

The golden snail's shell (*Pomaceae canaliculata*) contains up to 50.4161 % calcium oxide (CaO), which has the potential as a starting material for calcium carbonate extraction (CaCO3). The XRD diffractogram at 500°C indicates that pure CaCO3 was produced with a typical diffraction pattern at 2θ: 26.16° and 27.12°. Then it is assumed that the calcium carbonate (CaCO3) found in the shell of the golden snail (*Pomaceae canaliculata*) can neutralize the acid. However, further research is needed to determine the appropriate dose for use as an antacid.

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