

# Application of Golden Snail Shell Powder as a River Water Purifier

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**Abstract.** Golden Snail (*Pomacea canaliculata*) is a natural resource commodity in Indonesia that has not been utilized optimally, one alternative use is as a purifier in Cisadane river water. Utilization of the Cisadane river has the potential to produce waste that can damage the waters, causing problems in reducing river water quality both physically and chemically. The purpose of this study was to compare water quality with the addition of golden snail shell powder to the clarity of the Cisadane river water. The research carried out was to add golden snail shells to Cisadane river water at concentrations of 5%, 10%, 15% and 20%. showed that the golden snail shell was able to purify Cisadane river water and the best concentration of gold snail shell that could purify Cisadane river water was a concentration of 20%.

**Keywords:** Calcium Carbonat; Cisadane River Water; Clarity; Golden Snail Shell

## 1 Introduction

The golden snail (*Pomacea canaliculata*) is one of the natural resource commodities in Indonesia which is abundant in fresh water and most of it has not been used optimally. The golden snail belongs to the Mollusca group, has a soft body protected by a hard shell. the utilization of golden snail shell waste in Indonesia is not optimal, it is usually only used as a mixture of animal feed. Golden snail shells based on EDX results obtained the average weight of the chemical composition is 1.68% MgO, 1.04% Al<sub>2</sub>O<sub>3</sub> and 4.29% SiO<sub>2</sub> and 92.68% CaCO<sub>3</sub> [1]. The golden snail is a mollusk that is often found in rice fields and its population is increasing in a relatively fast time [2]. One of the causes of crop failure in rice fields is the presence of gold snail pests. The attack was from the seeding and early planting period [3]. The target of attack by this pest is the future saplings of plants and also plants from the shoots to the young stems. The development of gold snail pests is very fast, the eggs only take 1-2 weeks to hatch. One female gold snail is able to incubate 15 groups of eggs for 60-80 days which is one life cycle. Each group of eggs produced 300-500 eggs. Golden snails can save themselves in times of water shortage or drought. This pest can live in various cropping conditions, so it is called eating machines, due to its lifestyle which can eat continuously for 24 hours [4, 5].

From the chemical content, the golden snail shell can be used as an adsorbent in the adsorption process and as water purifier. Water is a very basic need for living things, especially humans. Water plays an important role in various human activities such as water for consumption, sanitation, transportation and so on [6]. The same role is needed in industrial activities. Many factories deliberately choose locations close to water sources such as rivers or the sea to facilitate access to get and use water [7]. Rivers are very important ecosystems for humans [8]. Cisadane River is one of the major rivers in Pasundan Area, Java Island, which empties into the Java Sea. The headwaters of this river are on the slopes of Pangrango mount, with a tributary that starts at Mount Salak, passes on the west side of Bogor Regency, towards Tangerang Regency and empties into Tanjung Burung. With a total length of about 126 km, this river crosses 44 sub-districts in Bogor Regency, Bogor City, Tangerang Regency, Tangerang City, and South Tangerang [9]. This river has a very high function and value for human life and wildlife [8]. Its utilization has the potential to produce waste that can damage waters, causing problems in decreasing river water quality. Utilization of land for agriculture, settlements, industry and domestic in the area around the river is a common problem of decreasing river water quality. In addition, the disposal of industrial and domestic wastewater into rivers, both treated and untreated, has the potential to cause river pollution. This condition is caused by every load of wastewater discharged into the river containing physical, chemical and biological parameters so that it can change the quality of river water. The ability of rivers to receive pollutant loads at every point and time varies due to differences in discharge in river flows [10].

Various industrial activity, if carried out excessively and uncontrolled, will cause water pollution of the Cisadane river to be serious condition than the current condition considering that the existence of this river is used by the surrounding community. So it is necessary to purify the water of the Cisadane river. Research on the purification of Cisadane river water has been carried out by Rachmawati and Rinawati, (2020) using zeolite adsorbent and silica sand and the results show that the use of this adsorbent can improve water quality physically, but cannot improve water quality chemically. In addition, zeolite and silica sand are chemicals that can have a negative impact on the future. One of the efforts that can be done to overcome the problem of Cisadane river water is to use water purifiers from natural ingredients that are not harmful to health and can bind heavy metals in the water. Calcium carbonate ( $\text{CaCO}_3$ ) is a chemical that able to solve this problem.  $\text{CaCO}_3$  in shellfish is able to clean water [11]. Another animal that contains calcium carbonate in its shell is the gold snail. Nopriansyah, et al, (2016) conducted research on the purification of Musi river water using gold snail shell powder and shrimp shell chitosan. The results showed that the golden snail shell powder was proven to be able to improve the water quality of the Musi River in terms of turbidity. From the description above, the author is interested in using the golden snail pest as a water purifier of Cisadane river water.

## **2 Materials and Methods**

### **2.1 Tools and Materials**

The materials used in this study were golden snails shell powder, Cisadane river water. The tools used in this research are mortar, blender, filter, oven, gas stove, container, bucket, glass, stirrer. This research was conducted at the Faculty of Engineering, Syekh Yusuf Islamic University.

## 2.2 Research Procedure

- a) Preparation of golden snail shell. The golden snail shell was cleaned, washed with water, then ground and blended until smooth. Then the golden snail shell powder is put into the oven at a temperature of 110°C for 3 hours [12].
- b) Cisadane river water sampling. Water samples taken from the cisadane river. Water samples were taken according to the standard method of SNI 6989.59-2008. A sample of 10 L of water was taken using a weighted bottle used at a certain depth, then combined for each sampling subpoint. Water samples were stored in dark containers.
- c) Analisa Sampel Sebelum Aplikasi. Each sample is observed for turbidity.
- d) Application of golden snail shell. The golden snail shell powder was added to each treatment in a row as much as 0 %; 5 %; 10 %; 15 %; and 20 %. The golden snail powder that has been added to the solution then stirred for 30 minutes. After stirring according to the specified time, the solution was allowed to stand for 24 hours. Then the solution that has been allowed to stand is filtered using filter paper [7, 12].
- e) Observation. Observation of turbidity by placing the sample in front of white paper and determine the level of clarity of the sample [7].

## 3 Results and Discussion

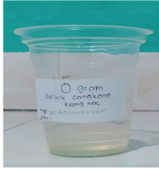
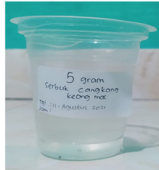
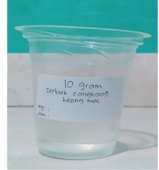
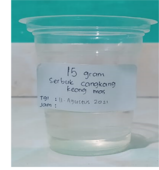
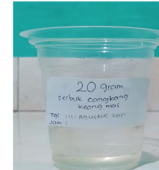
The golden snail shell which will be used as a water purification for the Cisadane river is pretreatment, including washed, making powder and dried, it as can be seen in Figure 1.

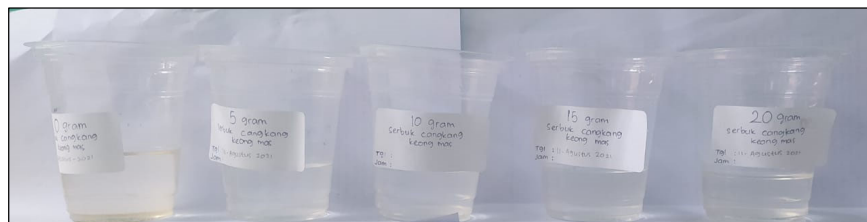


(a) (b)  
**Fig. 1.** Pretreatment of golden snail shell (a) clean golden snail shell  
(b) golden snail shell powder

The results of these observations on the use of golden snail shells (*Pomacea canaliculata* L) as purifiers in Cisadane river water with golden snail shell concentrations of 0%, 5%, 10%, 15% and 20% can be seen in Table 1. and Figure 2.

**Table 1.** The results of observations of addition of gold snail shell powder to the Cisadane river water

Concentration of Golden Snail Shell (%)	Research Result	Documentation
0	Turbid water color (brown)	
5	The color of the water is a little clearer and there is a little sediment	
10	The color of the water starts to clear, sediment and foam are more than the sample concentration of 5%	
15	The color of the water is clearer and more sediment than the sample concentration of 10%	
20	The color of the water is clear and the sediment is very much	



**Fig. 2.** Comparison of clarity level of the Cisadane river water after adding gold snail shell powder with various concentrations

From Table. 1 and Figure. 2 it can be seen that the addition of golden snail shells is able to purify the Cisadane river water. This is because the golden snail shell contains 92.68% calcium carbonate ( $\text{CaCO}_3$ ) [1]. Calcium carbonate is able to purify water because calcium carbonate has adsorption power. Adsorption is an absorption that occurs on the surface of the adsorbent. The occurrence of adsorption is caused by the attraction of atoms contained in a solid (adsorbent) to a certain substance [13]. In the adsorption process, the adsorbent tends to attract the molecules attached to the adsorbent. The golden snail shell is an adsorbent made from nature, so it is called a biosorbent. Biosorption is an alternative method that is environmentally friendly. This is because biosorbents come from natural material so they are safe for the environment. Biosorption from gold snail shells can be useful in absorbing some pollutants in nature and one of them is heavy metals [12].

From Table. 1 and Figure. 2 it can also be seen that the higher the concentration of gold snail shells, the higher the water clarity level of the Cisadane river, this is because the more gold snail shells added, the higher the water clarity level. In nature, turbidity or the opposite of clarity is due to contamination by clay, mud, organic matter and other suspended small particles [14]. Suspended solids (Total Suspended Solid) are all solid substances (sand, mud, and clay) or particles suspended in water and can be in the form of living (biotic) components such as phytoplankton, zooplankton, bacteria, fungi, or dead components (abiotic) such as detritus and inorganic particles. Calcium carbonate is a porous material that can bind to impurities in water so that it can be used as a water purifier. The more calcium carbonate is added, the greater the amount of porous material, so that more suspended substances are coagulated or precipitated [2]. This is similar to the research conducted by Simaremare (2013) which examined the improvement of the clarity of well water using calcium carbonate from clam shells, crab chitosan and shrimp chitosan. The largest increase in average clarity of well water was obtained by calcium carbonate from shells of 95.28%. Nopriansyah et al, (2016) also conducted research on increasing the clarity of the Musi river using gold snail shells and shrimp shells. The highest increase in water clarity of the Musi River was obtained by calcium carbonate from golden snail shells at 78%.

#### **4 Conclusion**

In this research it can be concluded that the golden snail shell can purify the Cisadane river water. The best gold snail shell concentration that can purify Cisadane river water is 20%, that the higher the concentration of gold snail shells, the higher the water clarity level of the Cisadane river. Suggestions for further research is to test the level of turbidity of water using analytical instruments

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