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Effectiveness of Pokea *(Batissa violaceae celebensis Martens, 1897)* shells in reducing hexavalent chromium

Kica Atmasari, Sri Anggarini Rasyid, Erwin Azizi Jayadipraja

Mandala Waluya University, Indonesia
Correspondence : kicaatmasari241217@gmail.com

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ABSTRACT

Introduction: Preliminary data obtained showed that the Hexavalent Chromium (VI) content found in the Lasolo River had a concentration of 0.3 mg/l which exceeded the quality standard. Pokea shellfish (*Batissaviolaceae celebensis Martens, 1897*) is an adsorbent used to reduce hexavalent chromium levels in water.

Method: The methodology used is experimental with a quantitative approach. This study used variations in adsorbent mass and contact time, with variations in adsorbent mass of 2.5 with variations in contact time for 30 minutes, 60 minutes, and 120 minutes.

Result: Adsorption effectiveness of Hexavalent Chromium (VI) using Pokea Shell powder (BatissaViolaceae Celebensis Martens, 1897) with a mass of 2.5 g with a variation of contact time of 30 minutes with a decrease of 16.53%.Adsorption effectiveness of Hexavalent Chromium (VI) using Pokea Shell powder (BatissaViolaceae Celebensis Martens, 1897) with a mass of 2.5 g with a variation of contact time of 60 minutes with a decrease of 21.37%.Adsorption effectiveness of Hexavalent Chromium (VI) using Pokea Shell powder (*BatissaViolaceae Celebensis Martens, 1897*) with a mass of 2.5 g with a variation of contact time of 120 minutes with a decrease of 33.46%.

Conclusion: The conclusion in this journal The most effective in reducing Hexavalent Chromium (VI) was using Pokea Shell powder (*BatissaViolaceae Celebensis Martens, 1897*) with a mass of 2.5 g with a variation of contact time of 120 minutes with a reduction of 33.46%.

Introduction

Water is a very important component for humans and other living things as a source of livelihood. One of the sources of water can come from surface water which can be defined as water that is above the ground either in a stationary condition or in flowing conditions such as rivers. The availability of surface water in the form of rivers in Indonesia has a large volume. Rivers are widely used as a supplier of drinking water, clean water, rice field irrigation needs, aquaculture, tourism to transportation. Clean water on this earth that is decreasing is caused by many factors that arise as a result of irresponsible human activities. [1]

Almost all rivers in Indonesia are polluted due to industrial activities, the quantity and quality of waste discharged into rivers is often uncontrolled.[2] The quality of river water in Indonesia is still not good enough. In 2019, Indonesia has 98 rivers, with a distribution of 54 lightly polluted rivers, 6 rivers with light-moderate pollution, and 38 rivers experiencing heavy pollution. Central Bureau of Statistics, 2020 the condition of rivers in 2019 in Indonesia was worse than in 2018. In 2018, there were 97 rivers with a total of 67 lightly polluted rivers, 5 rivers with moderate pollution and 25 rivers with heavy pollution. [3]

The decline in water quality is caused by the presence of contaminants in the form of organic components and inorganic components.[4] The many beneficial benefits of river water for humans certainly do not cover the fact that rivers are also natural resources that are vulnerable to pollution.[5]

The most dangerous pollutant for human health is heavy metals. The World Health Organization (WHO) or the World Health Organization and the Food Agriculture Organization (FAO) or the World Food Organization recommend not consuming seafood that is contaminated with heavy metals. Heavy metals have long been known as an element that has a very potential toxic power and has the ability to accumulate in the organs of the human body. Not even a few that cause death. Environmental problems in waters are a source of pollution originating from natural activities and human activities. Most of the pollution comes from industrial and mining processes, one of the sources of pollution can be heavy metals.[6]

Heavy metals are sources of pollutants that are very dangerous for the environment because they can disrupt the life of organisms in the environment if their presence exceeds a certain threshold. These heavy metals also threaten human health because they can become toxic compounds if they exceed the threshold and are in the human body. The effects of exposure to heavy metals on the body depend on the dose and can be harmful to human organs.[7]

The presence of chromium in nature is in the valence 3 (Cr^{3+}). and valence 6 (Cr^{6+}). The nature of Cr^{6+} solubility and high mobility causes Cr^{6+} to be more toxic than Cr^{3+}. Through the food chain, chromium can enter the body of living things. At certain doses chromium is toxic. The DNA structure can be damaged and even mutated when chromium enters the cell. The heavy metal chromium accumulates in the body and causes damage to the respiratory organs and is carcinogenic in humans.[8]

Based on [9]shell waste contains high calcium carbonate, which is 98%, which has the potential to be utilized. Pokea clam *(Batissa Violaceae Celebensis Martens Martens, 1897)* is a type of shellfish that is popular with the people of Southeast Sulawesi, especially in the Konawe, North Konawe and surrounding areas. Most of the use of Pokea shells *(Batissa Violaceae Celebensis Martens Martens, 1897)* is processed as food, so that the shells of Pokea shells, which are leftovers from food production, can generate quite a lot of waste. The large amount of Pokea clam shell waste *(Batissa Violaceae Celebensis Martens, 1897)* causes various environmental problems. Therefore serious efforts are needed to handle it so that it can be more beneficial and can reduce negative impacts on health and the environment. [10]

The purpose of this study was to determine the effectiveness of reducing hexavalent chromium

Method

The type of research used in this research is experimental research. Experimental research is research conducted with experimental activities (experiments) to find out the symptoms or effects as a result of certain treatments or experiments.

Result

Hexavalent Chromium (VI) levels were measured before adding Pokea shell powder (*BatissaViolaceae Celebensis Martens, 1897*) and after adding Pokea shell powder (*Batissa Violaceae Celebensis Martens, 1897*). The testing process with the addition of Pokea shell powder (*Batissa Violaceae Celebensis Martens, 1897*) was repeated 2 times with the same mass and contact time.

Table 1 above shows that the hexavalent chromium content in the initial sample was 0.496 mg/l. After adding Pokea shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897*) with a mass of 2.5 grams with a contact time of 30 minutes, the hexavalent chromium content became 0.414 mg/l in the first treatment and 0.414 mg/l in the repeated treatment. With an average hexavalent chromium content in the first treatment with repetition treatment, namely 0.414 mg/l. the percentage of effectiveness in reducing hexavalent chromium levels was 16.53%.

Table 2 above shows that the hexavalent chromium content in the initial sample was 0.496 mg/l. After adding Pokea shell powder (Batissa Violaceae Celebensis Martens Martens, 1897) with a mass of 2.5 grams with a contact time of 60 minutes, the hexavalent chromium content was 0.390 mg/l in the first treatment and 0.390 mg/l in the repeated treatment. With an average hexavalent chromium content of the first treatment with repetition treatment, namely 0.390 mg/l. the percentage of effectiveness in reducing hexavalent chromium levels was 21.37%.

Table 3 above shows that the hexavalent chromium content in the initial sample was 0.496 mg/l. After adding Pokea shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 grams with a contact time of 120 minutes, the hexavalent chromium content was 0.329 mg/l in the first treatment and 0.329 mg/l in the repeated treatment. With an average hexavalent chromium content of the first treatment with repetition treatment, namely 0.3295 mg/l. the percentage of effectiveness in reducing hexavalent chromium levels was 33.46%.

Table 1
Table of measurements of Hexavalent Chromium (VI) levels with a mass of 2.5 grams with a contact time of 30 minutes

Replication	Initial Sample (mg/l)	Analysis Results (mg/l)	Effectiveness of Adsorption results (%)
1	0, 496	0,414	16,53
2	0, 496	0,414	16,53
Average	0, 496	0,414	16,53

Table 2
Table of measurements of Hexavalent Chromium (VI) levels with a mass of 2.5 grams with a contact time of 60 minutes

Replication	Initial Sample (mg/l)	Analysis Results (mg/l)	Effectiveness of Adsorption results (%)
1	0, 496	0,390	21,37
2	0, 496	0,390	21,37
Average	0, 496	0,390	21,37

Table 3
able of measurements of Hexavalent Chromium (VI) levels with a mass of 2.5 grams with a contact time of 120 minutes

Replication	Initial Sample (mg/l)	Analysis Results (mg/l)	Effectiveness of Adsorption results (%)
1	0, 496	0,330	33,46
2	0, 496	0,330	33,46
Average	0, 496	0,330	33,46

Discussion

This research is a research that reuses Pokea shell waste *(Batissa Violaceae Celebensis Martens Martens, 1897)* as an adsorbent medium for Hexavalent Chromium (VI). Research on the adsorption ability of Pokea clam shells *(Batissa Violaceae Celebensis Martens Martens, 1897)* was carried out on hexavalent chromium specific metals using a type of Pokea shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897),* namely pure (Non-Act) clam shell powder.

1. Reduction of Hexavalent Chromium (VI) using Pokea Shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 g with a variation of contact time of 30 minutes

   Based on table 1 the hexavalent chromium content in the initial sample was 0.496 mg/l. After adding Pokea shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 grams with a contact time of 30 minutes, the hexavalent chromium content was 0.414 mg/l in the first treatment and 0.414 mg/l in the repeated treatment. With an average hexavalent chromium content in the first treatment with repetition treatment, namely 0.414 mg/l.An adsorption effectiveness percentage of Hexavalent Chromium of 16.53%.
2. Reduction of Hexavalent Chromium (VI) using Pokea Shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 g with a variation of contact time of 60 minutes

   Shows that the hexavalent chromium content in the initial sample was 0.496 mg/l. After adding Pokea shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 grams with a contact time of 60 minutes, the hexavalent chromium content was 0.390 mg/l in the first treatment and 0.390 mg/l in the repeated treatment. With an average hexavalent chromium content of the first treatment with repetition treatment, namely 0.390 mg/l.An adsorption effectiveness percentage of Hexavalent Chromium of 21.37%.
3. Reduction of Hexavalent Chromium (VI) using Pokea Shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 g with a variation of contact time of 120 minutes.

   Shows that the hexavalent chromium content in the initial sample was 0.496 mg/l. After adding Pokea shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 grams with a contact time of 120 minutes, the hexavalent chromium content was 0.329 mg/l in the first treatment and 0.329 mg/l in the repeated treatment. With an average hexavalent chromium content of the first treatment with repetition treatment, namely 0.3295 mg/l.An adsorption effectiveness percentage of Hexavalent Chromium of 33.46%.

   Hexavalent Chromium levels decreased after the addition of Pokea shell powder *(Batissa Violaceae Celebensis Martens*

Martens, 1897) with a mass of 2.5 g with a contact time of 120 minutes although there was no significant decrease. This can be seen from the percentage of hexavalent chromium adsorption effectiveness of 33.46% which is categorized as less effective according to predetermined objective criteria. This is because the contact time is relatively less and there is still dirt attached to the pores of the Pokea shell powder. However, when compared to the results of the analysis with a contact time of 30 minutes and 60 minutes, at a contact time of 120 minutes there was an increase in the percentage of adsorption.

According to Rahmatsyah's research testing the shell sample using the (XRD) test observed a CaO compound of 19.0%, and element C of 67.6%. Calcium carbonate ($CaCO_3$) physically has pores that can absorb other substances on the surface. Calcium carbonate is a material that can remove toxic substances, such as phosphate residues and from metals because calcium oxide (CaO) is an adsorbent component of calcium carbonate ($CaCO_3$) which can cause a mixture of toxic compounds. The resulting clam shell powder can adsorb heavy metals well.

Conclusion

Adsorption effectiveness of Hexavalent Chromium (VI) using Pokea Shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 g with a variation of contact time of 30 minutes with a decrease of 16.53%.Adsorption effectiveness of Hexavalent Chromium (VI) using Pokea Shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 g with a variation of contact time of 60 minutes with a decrease of 21.37%.Adsorption effectiveness of Hexavalent Chromium (VI) using Pokea Shell powder *(Batissa Violaceae Celebensis Martens Martens, 1897)* with a mass of 2.5 g with a variation of contact time of 120 minutes with a decrease of 33.46%.

Reference

1. Sri Septi Dyah Pratiwi. Impact Analysis of River Water Sources Due to Pollution of Sugar Factory and Sausage Manufacturing Factory. *J Res Educ Chem*. 2021;3(2):122.
2. Rumaisa D, Christy E, Hermanto H. Functions of the Surakarta Environmental Service in Controlling River Pollution (Study at the Surakarta City Environmental Service). *J Huk Bhakti Media*. 2019;3(2):128–41.
3. Firmansyah YW, Setiani O, Darundiati YH. Condition of Rivers in Indonesia in terms of Pollution Load Capacity: Literature Study. *J Serambi Eng*. 2021;6(2):1879–90.
4. Paus T, Hutapea H, Rachmawani D. Shellfish Shell Waste (Telescopium telescopium) As Adsorbent for Iron Heavy Metal (Fe). *J Indopacific Aquatic Resources*. 2019;3(2):115–22.
5. Dianira Prastiwi A, Kuntjoro S, Biologi J, Mathematics F, Knowledge I, University A, et al. Analysis of Copper (Cu) Heavy Metal Levels in Water Spinach (Ipomea aquatica) in the Prambon River, *Sidoarjo Analysis of Copper (Cu) Levels in Water Spinach (Ipomea aquatica) in Prambon River Sidoarjo*. 2022;11(2010):405–13.
6. Riset A. Bioacumulation of heavy metals chromium (cr) and cadmium (cd) in sediments and shells (anadara sp.) *In the tallo river east*. 2021;2(1):960–73.
7. Wulandari DD, Izzatunnisa S, Literature Review: Accumulation And Toxicity Of Heavy Metals: Cadmium (Cd), Chromium (Cr) And Nickel (Ni).. 2021;11(2):93–8. *Available from: https://ejurnal.poltekkes-manado.ac.id/index.php/jkl/article/view/1739%0Ahttps://ejurnal.poltekkes-manado.ac.id/index.php/jkl/article/download/1739/1080*
8. Nofiyanti E, Erviena A, Wardani GA, Salman N. Analysis of Chromium Heavy Metal

Contamination Content in the Citanduy Tributary, Tasikmalaya City. *J Cis-Trans).* 2020;4(2):15–8.

9. Ifa L, Akbar M, Fardi Ramli A, Wiyani L. Utilization of shell shells and crab shells as adsorbent of metals cu, pb and zn in waste of the gold mining industry. *J Chem Process Eng*. 2018;3(1):27.

10. Zanuma Z, Supodo T, Munir S, Depu AH. Effect of Leaflet and Video Methods of Health Counseling About Innecticided Gambus in Mabodo Primary Health Care. *Indones J Heal Sci Res Dev*. 2021;3(1):71-78. doi:10.36566/ijhsrd/vol3.iss1/57