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COMPARATIVE ANALYSIS OF HEAVY METAL SALTS IN PACKAGED DRINKING WATER

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Abstract

Comparative Analysis: Heavy Metal Salts in Packaged Drinking Water Bottled drinking water is purified and packaged water that is sold in plastic or glass bottles for easy consumption on-the-go. Many people choose to drink bottled water because it is convenient, portable, and easily accessible. There are many brands and types of bottled water available on the market, ranging from natural spring water to purified and filtered tap water. Some bottled water may also be infused with vitamins, minerals, or electrolytes for added health benefits.

While bottled water is a convenient option for staying hydrated, there are some environmental concerns associated with its production and disposal. Plastic bottles can contribute to pollution and harm wildlife when not disposed of properly. To reduce environmental impact, some companies are shifting towards more sustainable packaging options such as biodegradable bottles or refillable glass containers.

Overall, bottled drinking water is a popular choice for many people who prioritize convenience and cleanliness in their hydration habits.

Heavy metal salts are toxic substances that can have harmful effects on human health when consumed in high concentrations. These salts can leach into water sources from natural deposits or from industrial processes, leading to contamination of drinking water.

Exposure to heavy metals such as lead, cadmium, mercury, and arsenic can cause a range of health issues, including organ damage, developmental disabilities, and even cancer. Regular consumption of water containing high levels of heavy metal salts can have serious long-term health consequences.

To ensure that packaged drinking water is safe for consumption, it is important for manufacturers to adhere to strict quality control measures and testing protocols. Water treatment processes should be in place to remove or reduce heavy metal contaminants, and regular testing should be carried out to monitor levels of heavy metals in the water.

Consumers can also take steps to protect themselves by choosing reputable brands of packaged drinking water that adhere to strict quality standards and are transparent about their water treatment processes. It is also important to be aware of the potential sources of heavy metal contamination

in water, such as industrial pollution or aging infrastructure, and take steps to address these issues at a community or regulatory level.
There are several advantages of bottled water over tap water, including:
Convenience: Bottled water is readily available for purchase at convenience stores, grocery stores, and vending machines, making it easy to stay hydrated on the go.
Safety: Bottled water is often regulated by government agencies to ensure it meets strict safety standards, including being free of contaminants such as bacteria, parasites, and pollutants.
Taste: Some people prefer the taste of bottled water over tap water, finding it to be crisper and cleaner tasting.
Portability: Bottled water is easy to take with you on the go, whether you're heading to work, the gym, or on a road trip.
Variety: Bottled water comes in a variety of options, including still water, sparkling water, flavored water, and vitamin-enhanced water, allowing you to choose the type that best suits your preferences and needs.
Bottled drinking water has become increasingly popular in recent years due to its convenience and purity. However, concerns remain regarding the presence of heavy metal salts that may have harmful effects on human health. In this analysis, a study was conducted to analyze the heavy metal salt content of two samples of packaged drinking water, Ideal and Hydrolife, using atomic absorption spectrophotometer. In addition, the acidity and alkalinity of the water samples were assessed using a pH meter device.

Keywords: Chemical composition, Elemental analysis, Atomic Absorption Spectroscopy. Inductively Coupled Plasma, Accuracy – Efficiency, Metal elements, Concentration, Light absorption, Spectroscopy, Environmental monitoring, pharmaceutical analysis, Food safety, metals in drinking water, inductively coupled plasma source, drinking water, quality analysis of drinking water, pH indicator.

Introduction

AAS is a well-established technique that allows researchers to determine the concentration of specific metal elements in a sample. It works by measuring the absorption of light at characteristic wavelengths as it passes through a sample containing a metal of interest. AAS instruments typically consist of a light source, a sample chamber, a monochromator to separate specific wavelengths, and a detector to measure the intensity of absorbed light.
One of the main advantages of AAS equipment is its simplicity and ease of operation.
AAS instrumentation also offers versatility in terms of sample types to be analyzed. Whether liquid, solid, or even gaseous samples, AAS can handle a wide variety of materials. This flexibility makes it invaluable in fields as diverse as environmental monitoring, pharmaceutical analysis, food safety, and metallurgy.

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Atomic Absorption Spectrophotometer AA-7000 Series Shimadzu

Environmental factors: in the assessment of air quality indicators of atmospheric air, air of working environment and indoor air of residential buildings;

Liquid quality analysis: drinking water, surface and waste water, waste water from enterprises, technical water analysis and evaluation of quality indicators;

Biological fluids: in assessing the amount of metals in the blood and urine of workers working in harmful and dangerous working environments;

In determining the level of soil contamination with metals and assessing its quality;

Other additional cases: it creates an opportunity to evaluate various quality and quantity indicators in other types of industry, such as food products, drug production enterprises.

We have seen quality indicators of heavy metal salts in water samples with this AAS equipment.

The pH scale is used to regulate solutions based on how acidic or basic they are. It shows the concentration of hydrogen ions (H+) and hydroxide ions (OH-) in the solution. These ion concentrations are equal to each other in pure water, which has a pH of 7.

This pH value of 7 is important because it indicates a neutral solution. All other substances are compared to this point of neutrality.

The pH scale is a widely used scale for measuring the acidity or basicity of a substance. Values on the pH scale range from 0 to 14. Acidic substances have pH values between 1 and 7 (a substance on the pH scale of 1 is the most acidic) and alkaline or basic substances have pH values between 7 and 14. A completely neutral substance has a pH value of 7.

Abbreviation for "hydrogen potential" or "hydrogen strength" of a substance, pH can be expressed as the negative logarithm (base 10) of the hydrogen ion concentration in that substance. Similarly, the pOH value of a substance is the negative logarithm of the concentration of hydroxide ions in the substance. We also studied the pH of drinking water.

Analysis of heavy metal salts:

Chromium (Cr), iron (Fe), copper (Cu) and manganese (Mn) were the heavy metal salts analyzed in the study. The volume of water sampled for each analysis was 200 ml, and the permissible coefficient of chemical substances (REK) according to 950-2011 "Drinking water" was determined according to the State Standard.

For ideal packaged drinking water, the study showed that the heavy metal salt content was below the permissible limit for every element except iron. The results showed that the concentration of chromium heavy metal salts was 0.0188 mg/dm3, which is much lower than the permissible level of 0.05 mg/dm3. Similarly, the amount of copper was 0.074 mg/dm3, which was within the permissible limit of 1.0 mg/dm3.

Meanwhile, the concentration of iron in Ideal packaged drinking water was found to be 0.2563 mg/dm3, which is below the permissible limit of 0.3 mg/dm3. On the other hand, manganese was not detected in the Ideal water sample.

The research results for Hydrolife packaged drinking water showed that the heavy metal salt content for chromium was 0.0344 mg/dm3, copper was 0.01003 mg/dm3, and no manganese was detected in the hydrolife water sample. The concentration of iron in Hydrolife water was 0.148 mg/dm3, which is below the permissible level of 0.3 mg/dm3 for iron.

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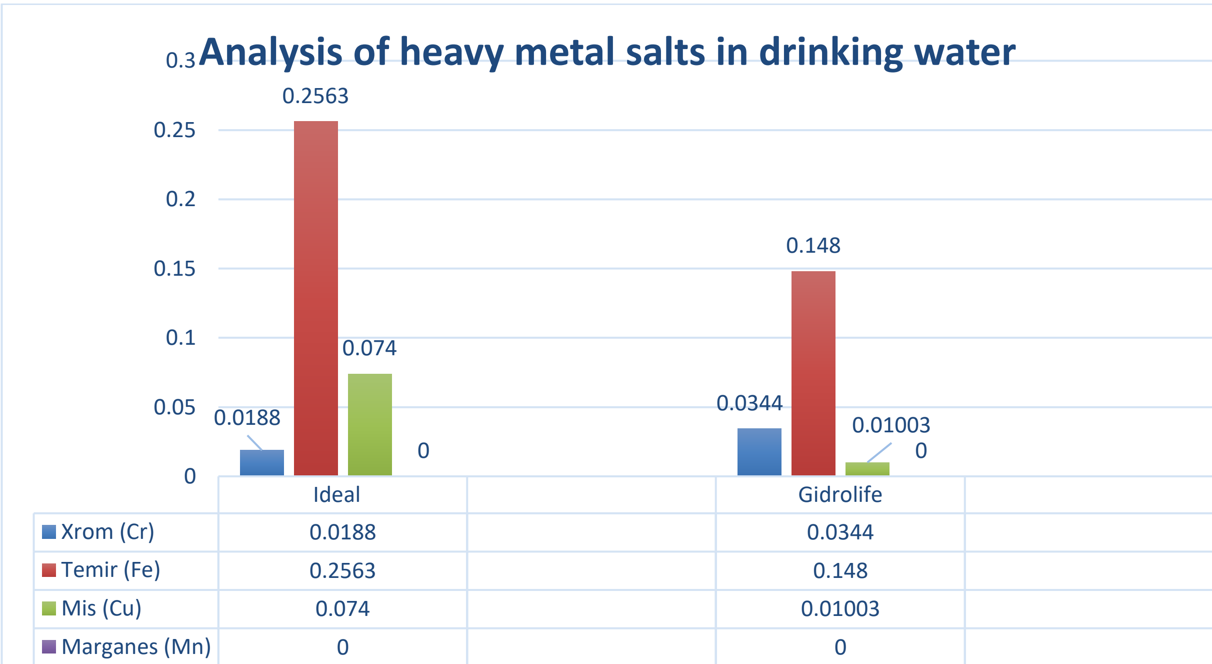
Analyzing the drinking water using an atomic absorption spectrometer showed a low level of heavy metal salts in both water samples, most of which were within or below the permissible concentration limits set by the relevant standards.

Assessment of acidity and alkalinity:

In addition to heavy metal salt analysis, the study also examined the acidity and alkalinity of water samples. Both drinking water samples showed a weak-alkaline environment.

ANALYSIS RESULTS OF IDEAL AND HYDROLIFE WATER

No	Analyzed indicators	Volume of water sampled	State standard 950-2011 "Drinking water" chemicals (REK)	Chemical substances identified in the composition	
1	Heavy metal salts in water				
				Ideal	Hydrolife
1-a	Chromium (Cr)	200 ml	0.05 mg/dm^3	0.0188 mg / dm ^{3}	0.0344 mg/dm ^{3}
1-p	Iron (Fe)	200 ml	0.3 mg/dm ^{3}	0.2563 mg/dm ^{3}	0.148 mg/dm ^{3}
1-s	Mis(Cu)	200 ml	1.0 mg/dm ^{3}	0.074 mg/ dm ^{3}	0.01003 mg/dm ^{3}
1-d	Marganes (Mn)	200 ml	0.1 mg/dm ^{3}	not identified	not identified
2	Acidity and alkalinity indicator of water _ _				
2-a	Weakly alkaline				



Summary

The results of the study show that Ideal and Hydrolife brands of packaged drinking water usually meet the permissible limits for heavy metal salts defined in the State Standard 950-2011 "Drinking water".

In addition, acidity and alkalinity evaluations indicate the degree of weak-alkaline status for both drinking water samples.

The results of this research test and analysis show that packaged drinking water brands meet the relevant standards for heavy metal salt content and pH level. However, it should be noted that this study only focused on a few heavy metal salts, and more extensive monitoring may be required to thoroughly assess the overall safety of packaged drinking water.

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