

ANALYSIS OF CALCIUM LEVELS OF PIG SPINES (*Tripneustes gratilla*) BY COMPLEXOMETRY METHOD

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ARTICLE INFORMATION

Received: 8 April 2026
Revised : 6 May 2026
Accepted: 12 June 2026
DOI:

KEYWORDS

Keywords: Rate; Calcium; Pig Thorn (*Tripneustes gratilla*); Complexometry

Keywords: Level; Calcium; Sea Urchin (*Three-pneustes gratilla*); Complexometry;

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A B S T R A C T

Background: Pig Thorns (*Tripneustes gratilla*) is one of the marine organisms that contains high amounts of calcium and has the potential to be a natural source of minerals. **Objective:** This study aims to measure calcium levels in pig spines (*Tripneustes gratilla*) by complexometry method using EDTA solution and murexide indicators. **Methods:** The research conducted was a quantitative test that aimed to determine the calcium level in pig spines (*Tripneustes gratilla*) using the complexometry method. The sample used in the form of gonads was obtained from 15 pig spines which were collected and then cleaned. The analysis process is carried out through direct titration, where the change in color from pink to purple signals the end point of the reaction. **Results:** The results showed that the level of sample I was 753.8% of the sample which was II 857.5% and the sample was III 919.8% and the average level of the three repetitions was 837.3%. **Conclusion:** The difference in the yield of the level may occur due to differences in the application of titration techniques, for example the inaccuracy of the addition of the solution or the lack of precision during the measurement process. In addition, the difference in the uniformity level of the sample used in each test can also affect the final result.

Backgraud: Sea urchin spines (*Tripneustes gratilla*) are a marine organism containing high levels of calcium and have the potential as a natural mineral source. This research aims to measure calcium levels in sea urchin spines (*Tripneustes gratilla*) using the complexometric method with EDTA solution and murexide indicator. The research conducted is a quantitative test aimed at determining the calcium levels in sea urchin spines (*Tripneustes gratilla*) using the complexometric method. The samples used were gonads obtained from 15 sea urchins that were collected and then cleaned. The analysis process was carried out through direct titration, where a color change from pink to purple indicated the end point of the reaction. The research results showed that sample I that is 753.8% calcium, sample II that is 857.5%, and sample III that is 919.8%, and an average level from three repetitions of 837.3%. Differences in results between repetitions likely occurred due to variations in the application of the titration technique, such as inaccurate timing of solution addition or lack of precision during the measurement process. In addition, differences in the uniformity level of the samples used in each repetition can also affect the final results.

INTRODUCTION

In Indonesia, pig thorns (*Gratilla three-pneusts*) is mostly used for daily household consumption, namely by catching directly in its habitat without any commercialization and cultivation efforts (Vimono, Of, and Urchln 2007). So that the condition of decreasing the availability of pig thorns (*Gratilla three-pneusts*) has created opportunities for pig spine aquaculture activities (*Gratilla three-pneusts*) has been done by several countries (Suryanti, Fatimah, and RudiYanti 2020). and sea urchins cultivation has now been carried out from laboratory scale to mass scale by fisheries agencies (Tasruddin and Aonurafiq 2016). Waters with lower or higher salinity can inhibit the spread of marine life. The salinity value that supports sea urchins life is in the range of 30-35 ppm (Noviana, Julyantoro, and Pebriani 2019). With the water conditions that are still natural, it is very easy to find marine life, especially species from Echinodermata, namely sea urchins (Simatupang, Sarong, and Ulfah 2017).

Pig Thorns (*Gratilla three-pneusts*), is one of the marine biota that stores a lot of potential calcium content. Research on pig spines can provide an overview of the mineral content contained in this animal's body parts that can be used in various fields (Ardiman 2020). Movement of pig spines (*Gratilla three-*

pneusts) This movement occurs through crawling activities by utilizing an elongated and slender tubular structure that extends out between sharp protrusions spread throughout the body (Nazar 2017). As for the pig thorns (*Gratilla three-pneusts*) Specialists in the fields of biology, biochemistry, and related disciplines use pig thorns for various purposes, including as a research model in laboratories, decorative ornaments, and medical applications, especially in the treatment of various diseases that affect humans (Toha et al. 2012). Pig Thorns (*Gratilla three-pneusts*) Hyperthermia can cause a decrease in sea urchin body mass up to 15%-30%. Meanwhile, the optimal temperature range that supports the survival of these organisms is in the interval of 28-32°C (Lubis 2016).

The morphology of the regularia sea urchin exhibits five radial symmetry characteristics with a configuration that is close to a spherical shape, while the irregularia group has a bilateral symmetry pattern with diverse shape variations (Zakaria 2013). Understanding the morphological characteristics of sea urchins (*Tripneustes gratilla*) is crucial considering that not all species of echinoderms are safe for human consumption. Various types of sea urchins that have been proven to be suitable for consumption include *Tripneustes gratilla*, *Diadema setosum*, *Strongylocentrotus franciscanus*, *S. droebrachiensis*, *S. purpuratus*, *Echinus esculatus*, *Mespilia globulus*, *Heliochidaris crassipina*, *H. tuberculata*, *H. erythogamma*, *Paracentrotus lividus*, *Echinometra mathaei*, *Echinothrix* sp, and *Salmacis* sp (Aziz 1993).

The reproductive organs of sea urchins of the *Tripneustes gratilla* species have a diverse nutritional composition, including protein, fat, and glycogen content. Other bioactive components contained in this organ include the minerals calcium and phosphorus, as well as various vitamins such as vitamin A, B complex (B, B2, B12), nicotinic acid, pantothenic acid, folic acid, and carotene. In addition to its consumption value, this sea urchin also shows therapeutic potential because it contains compounds that have the potential to be pharmacological ingredients to overcome various health conditions (Ardiman 2020).

Calcium functions in maintaining bone structure to stay strong and also plays a role in other biological functions, such as muscle contraction, nerve signal transmission, and blood clotting. Therefore, the analysis of calcium levels in certain parts of the body is essential to understand its mineral composition as well as its potential utilization (Wijayanti, Rianingsih, and Amalia 2018). The mineral calcium has a variety of vital functions in the body, including: actively participating in the blood coagulation mechanism, regulating the responsiveness of nerve and muscle tissues, supporting adhesion between cells, maintaining and improving the integrity of cellular membranes, serving as a cofactor for the activation of various enzymes, facilitating nervous system stimulation and muscle contraction, being involved in the process of blood cell aggregation, as well as acting as a mediator in response to hormonal signals and Hormone secretion process (Annafsil 2019).

The pharmaceutical world is an integral component of the health sector that focuses on the development and distribution of therapeutic products and related health services. Historically, university-level pharmacy education institutions in Indonesia were specifically designed to produce pharmacists who would lead pharmacy management. Along with the rapid advancement in the field of pharmaceutical science, the pharmacist profession or also known as pharmacist has now experienced a very wide career diversification. The expansion of career opportunities for pharmacists covers various strategic sectors, including: pharmacy and hospital facilities, government agencies, academic institutions, research and development centers, quality standards testing facilities, laboratories for clinical diagnosis, forensic investigation laboratories, as well as various industrial sectors including pharmaceutical manufacturing, cosmetic and cosmetic production, traditional herbal processing, medical herbal production, phytopharmaceuticals, nutraceutical supplements, health food, veterinary medicines, and vaccine production. In addition, they can also pursue careers in pharmaceutical information centers and health insurance institutions, all of which are arenas for pharmacists to implement their professional dedication in the field of pharmaceuticals (Mustiqawati et al. 2023).

METHOD

This type of research uses a descriptive quantitative method. The research carried out was a quantitative test that aimed to determine the calcium level in pig spines (*Tripneustes gratilla*) using the complexometry method. The sample used was pig spines (*Tripneustes gratilla*). This research was conducted at the Baubau Polytechnic Laboratory in April-July 2025.

The analysis of data from the results of the research on calcium levels of pig spines (*Tripneustes gratilla*) was then analyzed by the complexometry method using the concentration of Na₂EDTA.

RESULTS & DISCUSSION

Table 1. Results of Calcium Levels of Pig Spines (*Tripneustes gratilla*).

No.	Sample Treatment	Sample Weight	Na ₂ -EDTA molarity (M)	Titration Volume (mL)	%Calcium Levels (%)	Average % Calcium level (%)
1.	Sample I	5 grams	0.0153 m	6 mL	753,8%	837,3%
2.	Sample II	5 grams	0.0153 m	7 mL	857,5%	
3.	Sample III	5 grams	0.0153 m	7.5 mL	919,8%	

Source: Primary Data, 2025

From the results of the study in table 1. it can be seen that the average Analysis of Calcium Levels of Pig Thorns (*Tripneustes gratilla*) with the Complexometric Method is 837.3

Table 2. Discoloration of pig spines (*Tripneustes gratilla*) before and after titration

Sample Treatment	Titration Endpoint Color Change
Sample I	Pink turns purple
Sample II	Pink turns purple
Sample III	Pink turns purple

Source: Primary Data, 2025

From the results of color change in table 2. It can be seen that the color change before titration is pink and after titration it changes to purple.

COVER

Based on the results of the research that has been conducted, it can be concluded that the calcium level in pig thorn samples (*Tripneustes gratilla*) analyzed by the complexomeri method averaged 8.781%. The limitations of this study are that pig spine samples cannot be found at any time in addition, murekside indicators are not available in the lab so they must be obtained outside.

THANKS

The author would like to express his appreciation and gratitude to Apt. Sri Yolandarari, S. Farm., M.Si, and Apt. Ratih Nurwanti, S.Farm., M.Si, for all the guidance, advice and support given during the writing of this journal.

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