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Iodine deficiency in *Thasus gigas* used as a treatment for thyroid in the Mezquital Valley, Hidalgo, Mexico

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ABSTRACT

Iodine is a trace element essential for thyroid function in the synthesis of T3 and T4. It is one of the main reasons why residents of some areas in the state of Hidalgo consume Thasus gigas, known as chawis or xamues.
Objective. *Determine the presence or absence of iodine in secretions from Thasus gigas.*
Methodology. *The technique was used to determine starch in potato infusion in reverse, that is, the reddish secretion from the chauis or xamues was added to 10 samples with potato infusion. If that secretion contained iodine, a color change to navy blue was expected. When we use potato infusion and add iodine or potassium iodide, this color change occurs.*
Results. *When adding the reddish secretion, similar in color to iodine, to the potato infusion samples, no color change was observed, much less the expected navy blue color, indicating the absence of iodine.*
Conclusion. *The reddish secretion characteristic of Thasus gigas does not contain iodine; rather, it could be a hormone-like secretion that the insect uses as a defense mechanism.*

Keywords: *intake of Thasus gigas, thyroid hormones, and iodine in Thasus gigas.*

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Introduction

Iodine is an essential trace element for thyroid function, particularly in the synthesis of thyroid hormones (triiodothyronine T3 and thyroxine T4), which play a role in regulating the body's metabolic processes and are also responsible for the optimal development of the central nervous system and the brain [1][2].

However, this element cannot be synthesized by the human body, so it must be consumed in food.

Effects of iodine deficiency

A diet deficient in iodine can lead to mental retardation, hypothyroidism, birth defects, goiter, or a low IQ, while an excess of iodine can cause iodine-induced hyperthyroidism [3].

Iodine deficiency is one of the biggest public health problems and affects countries such as the United States, Ireland, the United Kingdom, Australia, and Mexico [4].

Iodine deficiency disorders occur when iodine intake and absorption are insufficient to meet the thyroid gland's requirements for synthesizing adequate amounts of the hormones thyroxine and triiodothyronine.

Goiter is the best-known disorder due to its clear symptoms; however, in recent decades, less symptomatic disorders have been recognized, such as the adverse impact of insufficient iodine intake on the mental and physical development of children, as well as on the productivity of adults [5].

A deficiency of this element has different effects at each stage of life; during pregnancy, it leads to an increase in the rate of miscarriages, perinatal mortality, and congenital malformations [6]; in newborns, it has been linked to low birth weight, neonatal goiter, and cretinism [7] ; in infants, school-age children, and adolescents, it has been linked to delayed mental development, deaf-mutism, growth and developmental delays, goiter, motor abnormalities, and hypothyroidism; while in adults, goiter, hypothyroidism, and cognitive impairments have been observed [8].

Food sources of iodine

Some of the main dietary sources of iodine include iodized salt, eggs, milk and certain dairy products, seafood (fish, salmon, seaweed, lobster, shellfish, and other seafood), and certain baked goods [9]. On the other hand, the amount of iodine in fruits and vegetables depends on the type of soil in which they were grown [10], and it is also known that the iodine content in marine plants (algae) is higher than in terrestrial plants [11].

The concentration of iodine in milk depends on how the animals are raised and kept (outdoors or indoors). This, in turn, is affected by overgrazing in the areas where the animals feed or by deforestation [12]. The most effective strategy for controlling iodine deficiency has been the iodization of salt for human consumption; salt used in the production of processed foods is the most important, in addition to the iodization of salt for household use, according to the guidelines of the WHO/UNICEF/International Council for the Control of Iodine Deficiency Disorders [13][14][15]. However, restricting salt intake as a measure to control high blood pressure has led to iodine deficiency. Some additional sources of iodine include iodinated contrast media, water purification tablets, and multivitamins [13].

Where iodine comes from

The largest reservoir of iodine is found in the ocean; from there it is transported to terrestrial areas through volatile chemical forms or via marine aerosols carried by the wind, which explains why soils far from the ocean are generally deficient in iodine and, consequently, plants that grow or are cultivated in these soils will have low concentrations of the element [4].

Little is known about how this element accumulates in terrestrial plants. However, in a study conducted on pumpkin plants, electron microscopy revealed that when inorganic and organic iodine were applied directly to the substrate, most of the iodine accumulated in the roots. A small amount was transported to the aerial parts and stored in the chloroplasts [16]. This finding could partially explain its ability to induce tolerance to certain types of stress, given that a significant portion of the cellular antioxidant machinery is located in the chloroplasts [17]. Numerous attempts have been made to address iodine deficiency, primarily through the universal iodization of table salt since the 1920s [18][19].

Consumption of insects for medicinal purposes due to their iodine content

Since ancient times, insects have been used for therapeutic purposes in many cultures.

Among the most significant references to the use of insects for their medicinal properties are the Ebers Papyrus, the Florentine Codex, and the Natural History of New Spain, which detail the naturalistic knowledge of various cultures that used and classified diverse arthropods useful for curing diseases [20]. In general, insects are used to treat respiratory, renal, hepatic, stomach, intestinal, parasitic, pulmonary, bronchial, cardiac, endocrine, neurological, circulatory, dermatological, ophthalmological, spleen, pancreas, and reproductive system conditions, among others [21]. The therapeutic use of insects and their derivatives is known as entomotherapy [22].

These organisms have also played a mystical and magical role in the treatment of various diseases; the medicinal interaction between humans and insects has recently sparked the interest of many researchers in this practice, although it remains largely unknown in academic circles [23].

Knowledge and practices related to entomotherapy are largely transmitted through oral tradition from one generation to the next and are therefore not widely disseminated. However, the use of insect species as medicinal resources is an ancient practice [23].

Ramos-Elorduy recorded 210 insect species used in traditional Mexican medicine. The most commonly used orders are Coleoptera, Hymenoptera, Orthoptera, and Homoptera [20].

*Thasus gigas i*s an insect belonging to the order Hemiptera that has therapeutic uses in the Mezquital Valley in the state of Hidalgo, such as in the treatment of type 2 diabetes, respiratory diseases, and thyroid problems caused by iodine deficiency. There is a precedent described in the literature: reports that Dr. Crecenciana Rodríguez Nieves uses these bugs to treat goiter, as they are rich in iodine and goiter is caused by iodine deficiency [22]. Therefore, the objective of this study was to test the hypothesis held by the population that *Thasus gigas* contains iodine and thus aids in the treatment of people with thyroid problems.

Methodology

An entomological collection was conducted using a convenience sample in May 2023, during which 10 specimens of *Thasus gigas* were collected using a tool consisting of a stick and a half-bottle shaped like a funnel. They were placed in plastic tubes labeled with identification data such as the date, location, and condition of the collected material (alive), They were morphologically identified using a stereoscopic microscope and an identification key for *Thasus* species by Brailovsky et al. 1994. Next, a simple test was conducted to detect iodine: two potatoes were boiled in purified water, and the resulting broth is rich in starch.

If, when adding 1 to 3 ml of iodine or Lugol's solution ("potassium iodide") to a container of potato broth, the solution turns a deep navy blue, this indicates the presence of carbohydrates, "starch," so the demonstration was conducted as follows.

Potato infusion was added to two plastic containers. In container 1, the substance secreted by *Thasus gigas* was added; this was obtained by handling the insect, which excretes this unknown substance when stressed. The substance has a brownish hue very similar to iodine, hence the belief that these insects contain it. In container 2, ordinary iodine tincture was added, and we waited to observe the reaction. If there is a bluish color change in the potato infusion, the reaction will be positive, indicating the presence of carbohydrates ("starch"). Similarly, if adding the potato infusion to the substance secreted by the insect produces a blue color, it means that the secretion contains iodine.

This procedure was performed on the 10 entomological samples of *Thasus gigas* and repeated three times to ensure greater accuracy in the results

Results

In the containers with potato broth containing the substance excreted by *Thasus gigas*, there was no change in color, so the reaction was negative; that is, there was no presence of iodine. In the containers where iodine tincture was added to the potato broth, a positive reaction was observed, resulting in a color change to a bluish hue immediately upon contact, thus confirming the presence of starch and of iodine as an indicator of it. (Table 1) (Figure 1).

Table 1: Results of the simple iodine test starch indicator with an intense navy blue color

Potato infusion-solution	Indicator reagent	Result
Vials 1-10	*Thasus gigas extract*	Negative
Vials 1-10	Iodine tincture	Positive

Figure 1. On the left, a negative reaction in potato broth and the substance secreted by *Thasus gigas* from container 1; on the right, a positive reaction indicated by the color change in potato broth and iodine solution from container 2.

Figure 1: Reactions in a simple starch test when reacting with iodine as an indicator (deep navy blue color)

Discussion

Several chemical composition analyses of edible insects exist; some examples are the following: a proximate chemical analysis of insects consumed in the State of Hidalgo reports the presence of essential and non-essential amino acids, minerals such as sodium, potassium, calcium, zinc, iron, and magnesium, vitamins, and proteins; however, iodine is not mentioned in said composition [23]. Another study mentions different types of nutrients present in three species of edible insects through a proximate chemical analysis, including carbohydrates, lipids, proteins, and phenols, but does not indicate iodine as a component [24]; yet another study on a chemical analysis of the composition of an insect and its comparison with other edible species also coincides with the presence of carbohydrates, proteins, and fats but does not report the presence of iodine [25]; another study on the nutritional content of an edible insect in north-central Mexico reports the presence of amino acids, proteins, lipids, and fatty acids, but likewise does not report the presence of iodine [26]; Finally, a study on a proximate chemical analysis carried out in the state of Hidalgo on Thasus gigas reports results regarding proteins, fat, ash and crude fiber, however, no mention is made of iodine as a component of this [27].

Another important factor to consider is that in the Mezquital Valley region, the soils are not rich in iodine, so this insect would have no way of obtaining it; According to the FAO iodine deficiency occurs in many regions of the world but is more pronounced in mountainous areas, valleys, plains, and lowlands [14], due to the irregular distribution of iodine in the Earth's crust, as is the case in the Mezquital Valley in the state of Hidalgo. Regarding the food safety of this insect when consumed raw for therapeutic purposes in *Thasus gigas,* the presence of bacteria of importance to humans, such as *Serratia*, *E. coli, Acinetobacter*, *Enterococcus* faecalis, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Pasteurella stomatis*, *Corynebacterium,* and the fungus *Candida albicans,* with a high concentration of colony-forming units (CFU), so it is likely to cause an infection; therefore, it would be important to weigh the costs and benefits of consuming it. Hypothetically, it could also involve hormonally active ingredients that play a role in lowering glucose levels in people with type 2 diabetes mellitus. When collected directly, they caused a disruptive effect, with phosphenes and fatigue occurring almost immediately upon contact. Additionally, we are awaiting the publication of a study demonstrating a significant effect on hyperglycemia in people with type 2 diabetes mellitus. The consumption of this insect is traditional in some towns and cities of Hidalgo. Research regarding its health effects began with the work carried out by Ruvalcaba and colleagues [28] [29] [30] [31].

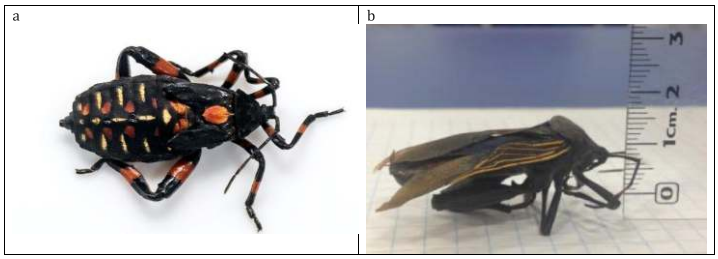

Figure 2: Thasus gigas "Xamues" a juvenile stage, b adult stage

Conclusions

The consumption of insects for medicinal purposes can contribute to human nutrition and help improve certain health conditions; however, it also carries several health risks due to the presence of pathogenic microorganisms, allergens, heavy metals, and even pesticide residues, which are generally considered low levels provided that they are handled in accordance with food safety standards, which is why there is concern regarding those harvested from the wild, where safety variables are not controlled, as is the case with some insects that are consumed alive for therapeutic purposes, such as *Thasus gigas*. A simple iodine test revealed that *Thasus gigas* does not contain iodine; the beliefs and culture of this population may influence the improvement of these conditions, Similarly, the insect may contain some other substance capable of producing such beneficial effects; therefore, it is worthwhile to continue conducting studies that allow us to understand the advantages and disadvantages of consuming insects for therapeutic purposes that do not pose a risk to public health.

Conflict of interest. The authors declare that there is no conflict of interest regarding the publication of this article.

Artificial intelligence. The authors declare that no artificial intelligence tools were used in any section of this article.

References

1. O'Kane, S.M.; Mulhern, M.S.; Pourshahidi, L.K.; Strain, J.J.; Yeates, A.J. Micronutrients, Iodine Status and Concentrations of Thyroid Hormones: A Systematic Review. Nutr. Rev. 2018. 76, 418–431.
2. Pironi, L.; Guidetti, M.; Agostini, F. Iodine Status in Intestinal Failure in Adults. Curr. Opin. Clin. Nutr. Metab. Care. 2015. 18, 582–587.
3. Santos, J.A.R.; Christoforou, A.; Trieu, K.; McKenzie, B.L.; Downs, S.; Billot, L.; Webster, J.; Li, M. Iodine Fortification of Foods and Condiments, Other than Salt, for Preventing Iodine Deficiency Disorders. Cochrane Database Syst. Rev. 2019. 2, CD010734
4. Zimmermann, M. B. Iodine requirements and the risks and benefits of correcting iodine deficiency in populations. Perspectives in Medicine. 2014. 2(1–4), 56–67. https://doi.org/10.1016/j.permed.2013.07.001
5. Lazarus, J. H. The importance of iodine in public health. Environmental geochemistry and health. 2015. 1-14 pp.
6. Luis, D. A. de, Aller, R., & Izaola, O. Problemática de la deficiencia de yodo durante la gestación. Anales de Medicina Interna. 2005. 22(9), 445-448. http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S0212-71992005000900011&lng=es&tlng=es.
7. Fitzgerald P.A. Trastorno por deficiencia de yodo y bocio endémico. Papadakis M.A., & McPhee S.J., & Rabow M.W.(Eds.), Diagnóstico clínico y tratamiento. 2021. McGraw-Hill Education. https://accessmedicina.mhmedical.com/content.aspx?bookid=3002&sectionid=256377273
8. Linus Pauling Institute. Yodo. Oregon State University. 2016. https://lpi.oregonstate.edu/es/mic/minerales/yodo
9. Krzepilko, A.; Zych-Wezyk, I.; Molas, J. Alternative Ways of Enriching the Human Diet with Iodine. J. Pre-Clin. Clin. Res. 2015.
10. Office of Dietary Supplements (ODS). Iodine: Health Professional Fact Sheet. National Institutes of Health. 2024. https://ods.od.nih.gov/factsheets/Iodine-HealthProfessional/
11. Fuge, R. Geochemical aspects of iodine in the environment and its significance for human health. Science of the Total Environment. 1988. 71(1), 1–24. https://doi.org/10.1016/0048-9697(88)90249-3
12. Hetzel BS. The concept of iodine deficiency disorders (IDD) and their eradication. In: Dunn JT, Pretell EA, Daza CH, Viteri FE (eds) Towards Era-dication of Endemic Goiter, Cretinism, and Iodine Deficiency. Pan American Health Organization Sc Pub 502, Washington, D.C.,1986. pp. 109-114.
13. World Health Organization. United Nations Children's Fund & International Council for the Control of Iodine Deficiency Disorders. Assessment of iodine deficiency disorders and monitoring their elimination. 3rd ed. Geneva, Switzerland
14. Food and Agriculture of the United Nations (FAO). The state of food insecurity in the world, Rome: Electronic Publishing Policy and Support Branch Communication Division. 2009. ftp://ftp.fao.org/docrep/fao/012/i0876e/i0876e_flyer.pdf.
15. Zimmermann, M. B. The remarkable impact of iodisation programmes on global public health. Proceedings of the Nutrition Society. 2023. 82(2), 113–119. https://doi.org/10.1017/S0029665122002762
16. Weng, H. X.; Hong, C. L.; Yan, A. L.; Pan, L. H.; Qin, Y. C. and Bao, L.T. Mechanism of iodine uptake by cabbage: effects of iodine species and where it is stored. Biol. Trace Elem. Res. 2008.125(1):59-71.
17. Krela-Kaźmierczak, I., Czarnywojtek, A., Skoracka, K., Rychter, A. M., Ratajczak, A. E., Szymczak-Tomczak, A., Ruchała, M., & Dobrowolska, A. Is There an Ideal Diet to Protect against Iodine Deficiency?.2021. *Nutrients*, *13*(2), 513. https://doi.org/10.3390/nu13020513
18. Charlton, K. E.; Jooste, P. L.; Steyn, K.; Levitt, N. S. and Ghosh, A. A lowered salt intake does not compromise iodine status in Cape Town. South Africa, where salt iodization is mandatory. Nutrition. 2013. 29(4):630-634
19. Serrano-González, R., Guerrero-Martínez, F., Pichardo-Barreiro, Y., y Serrano-Velázquez, R. Los artrópodos medicinales en tres fuentes novohispanicas del siglo XVl. 2013. Etnobiología. 11 (2). Disponible en: https://www.academia.edu/12139592/Los_artr%C3%B3podos_medicinales_en_tres_fuentes_novohispanas_del_siglo_XVI
20. Ramos-Elorduy, J. ¿Tienen los insectos propiedades terapéuticas? In: Congreso Internacional de Medicina Tradicional y Alternativas Terapéuticas. Ciudad de México. 2001. Memorias. México. p 135-136.
21. Costa-Neto, E.M, Ramos-Elorduy,J. y Pino, J.M. Los insectos medicinales: primeros resultados. Boletín Sociedad Entomológica Aragonesa. 2006. 38, 395-314. Disponible en: http://sea-entomologia.org/Publicaciones/PDF/BOLN38/395_414_BolnSEA38InsectosMedicinales.pdf
22. Costa-Neto E.M. Entomotherapy, or the medicinal use of insects. Journal of Ethnobiology. 2005. 25(1): 93-114. Disponible en: https://bioone.org/journals/journal-of-ethnobiology/volume-25/issue-1/0278-0771_2005_25_93_EOTMUO_2.0.CO_2/Entomotherapy-or-the-Medicinal-Use-of-Insects/10.2993/0278-0771(2005)25[93:EOTMUO]2.0.CO;2.full
23. Ramos-Elorduy, J., Pino Moreno, J.M. y Morales de León, J.M. Análisis químico proximal, vitaminas y nutrimentos inorgánicos de insectos consumidos en el Estado de Hidalgo, México. *Folia Entomol*. 2002. Mex.41(1): 15-29. Disponible en: http://acaentmex.org/folia/revista/Vol%2041/Vol41Num1/15-29.pdf
24. Barrios-Morales, M.L., Peralta-García, X.P., Salazar, R. y Maldonado-Astudillo, Y.I. Análisis físico y químico proximal, de tres especies de insectos comestibles en Guerrero, México. Acta Agrícola y Pecuaria. 2022. 8: 1-8. Disponible en: http://aap.uaem.mx/index.php/aap/article/view/472/141
25. Barrera-Molina,A. Análisis químico proximal de *Corydalus sp.* Y su comparación con insectos comestibles. Inventio. la genesis de la cultura universitaria en Morelos. 2019. 2448-9026. Disponible en: https://www.researchgate.net/publication/342057128_Analisis_quimico_proximal_de_Corydalus_sp_y_su_comparacion_con_otros_insectos_comestibles
26. Cruz Lavana, J.D. Contenido nutricional de las larvas, densidad de nidos y propiedades físico-quimicas del suelo del hábitat de la hormiga escamolera (*Liometopum apiculatum Mayr*) en el centro-norte de México. 2019. Colegio de postgraduados. 94 p. Disponible en: http://colposdigital.colpos.mx:8080/jspui/bitstream/handle/10521/3191/Cruz_Labana_JD_DC_Ganaderia_%202019.pdf;jsessionid=2575583B60FFF78F3A42C64F2F8EA2F7?sequence=1
27. Mendoza M.N., Quintero L.A., Guemes V.N., Soto S.S. López H.G., Reyes S.Ma.I. Utilización de "xamui" (Thasus gigas) en la lelaboración y conservación de una salsa tradicional en el Valle del Mezquital. Universidad Autónoma del Estado de Hidalgo. 2009. https://www.uaeh.edu.mx/investigacion/icap/LI_GranSem/Norma_Vera/25.pdf
28. Monroy Moncayo N, Valdez Vargas E, Amador Chávez MM, García Fragoso DG, Reynoso Vázquez J, De la O Arciniega M, and Ruvalcaba Ledezma JC. IS INGESTION OF *THASUS GIGAS* (XAMUES) AN ALIMENTARY CULTURE OR AN AUXILIARY TREATMENT FOR TYPE II DIABETES? Afr J Tradit Complement Altern Med. (2014) 11(4):131-135 http://dx.doi.org/10.4314/ajtcam.v11i4.20

29. Zamora López MC, Jiménez Pérez AJ, Castillo Sandoval AG, García Michel A, Canales Martínez ME, Ruvalcaba Ledezma JC. Intake of the "Chahuis" Bedbug *Thasus Gigas* Burn (Xamues) By Diabetic Patients for Glucose Control. *IOSR Journal Of Pharmacy, 2014. www.iosrphr.org Volume 4 Issue 2(February 2014), Pp 44-49*

30. Calderón Nava OE, Pérez Hernández I, Cruz Almaraz LD, Ruvalcaba Ledezma JC. Insects *Thasus gigas* Burm (Xamuis) to the problem of Diabetes in Actopan Hidalgo, Mexico. *IOSR Journal Of Pharmacy, 2014; www.iosrphr.org Volume 4, Issue 2 (February 2014), PP. 39-42*

31. Echavarría Flores Montserrat, García Torres María Elena, Calderón Ordoñez Marisela Belem, Olvera Luna Alba Grisel, Jesús Carlos Ruvalcaba Ledezma. Thasus gigas Burn: a new treatment for diabetes or nutrimental culture. *Drug Discovery*, 2014, 9(20), 18-19