SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 7.
Issue: 12.
Page N. 120-125
Year: 2023

Original Article www.wjahr.com

BROMATOLOGICAL ANALYSIS OF BLACK IGUANA (CTENOSAURA PECTINA) MEAT FROM THE STATE OF NAYARIT

Dr. Ascencion Montalvo*, Jorge Rafael Figueroa Morales

MEdical Doctor Av. Allende 117 Tepic Nayarit 63000.

Received date: 17 Sep. 2023 **Revised date:** 07 Oct. 2023 **Accepted date:** 27 Oct. 2023

***Corresponding Author: Dr. Ascencion Montalvo**
MEdical Doctor Av. Allende 117 Tepic Nayarit 63000.

ABSTRACT

In the state of Nayarit, as in other regions of Mexico, the meat of wild animals is used as food, reptiles are not alien to this activity, this is due to their high abundance in a wide variety of environments. Records indicate that iguanas of the genus Ctenosaura are one of the reptiles most used as a source of protein. However, there are not enough studies to verify the nutritional properties that this species could have. The objective of this research was to identify and quantify the amount of proteins present in black iguana meat as well as the concentration of vitamins such as A, D, and, E. A 22.4 % protein content was found in the meat of this reptile, which positions it as a good source of obtaining this compound. In relation to the concentration of vitamins, a total of 244 µg/100 g of vitamin A was found, and 1013 µg/100 g of vitamin E, on the other hand, no traces of vitamin D were observed. Based on these results we can conclude that the Iguanal meat can be a complement to the diet, however, the consumption of this species must be done rationally, that is, supported by research centers and the corresponding authorities, since intensive consumption would endanger the preservation of the species.

KEYWORDS: Consumption, Meat, Iguana, Proteins, Vitamins.

INTRODUCTION

Wildlife is a resource constantly used by humans for its multiple values, which depend on each taxonomic group and its specific historical and geographical context. In Mexico, a large part of rural residents and ethnic groups are settled in the states with the greatest biological diversity. This proximity between humans and the ecosystem has allowed the creation of a diversity of relationships and associations, translating into knowledge that includes the perception, use and management of the biodiversity of the environment.[1] Currently, communities continue to use a variety of species as sources of proteins, fats, medicinal substances, clothing, tools, ornaments, ritual objects and income, among other purposes.(2) In Mexico, several species of wildlife are used for different purposes. Most are obtained through hunting. It is considered an activity whose main objective is to satisfy the basic needs of hunters and their families. The personal consumption or sale of meat, skins, pets, and medicinal substances are some of their main purposes.[2,3]

The state of Nayarit, located on the Pacific coast of Mexico, is home to a wide variety of animal and plant species.[4] In this state, as in other regions of Mexico and the world, there are traditional and cultural practices in which the meat of wild animals is used as food, reptiles are not alien to this activity, this is due to their high abundance in a wide variety of environments. Records indicate that iguanas of the genus Ctenosaura are one of the reptiles most used as a source of protein and as medicine (zootherapy).[2,3,5]

The black iguana (Ctenosaura pectinata) is a species of the Ctenosaura genus that lives in western Mexico, where it is distributed from the south of Sonora to Chiapas, penetrating the Balsas basin to Morelos, Puebla and the State of Mexico.[5] Black Iguana babies weigh approx. 4.5 g and measure 9 to 12 cm. As adults they can measure up to 1.4 m. Their eating habits (in the wild) are classified according to their age; when they enter adulthood.[6]

This reptile lives in the low deciduous forest and helps to reforest the jungles. It belongs to the class reptilia, family iguanidae, genus Ctenosaura and species pectinata.[7] It is considered a source of food in rural communities, due to the protein in its meat and at the same time the sale of its skin, eggs and medicinal uses is a source of income for marginalized communities.

Black iguana meat is consumed in Mexico and Central America, with the aim of remedying anemia problems, improving eyesight, and its blood is taken to replenish pregnant women, according to what some literature mentions.[2] However, there is no specific research on the properties that popular knowledge attributes to iguana meat, there are not enough studies to verify the nutritional and/or pharmacological properties that this species could have.

The lack of knowledge on the part of the meat-consuming population of this reptile about the nutritional value becomes the justification of this research, which aims to provide the population with bromatological bases on the nutritional content of iguana meat and take advantage of it; contributing to this extent to adopt rational nutrition plans based on the meat of the aforementioned species.

MATERIAL AND METHODS

To carry out this work, 2 black iguanas (Ctenosaura pectinata) of similar size and weight were used, acquired during a period from May to July 2020. The species were donated by hunters from the municipality of Amatlán de Cañas Nayarit, they had on average 1 hour after being captured, after being taxonomically classified, they were transported without skin in a cooler with enough ice, to the Food Science and Technology laboratory of the Technological Institute of Tepic, Nayarit for subsequent freezing (-60 °C), only leaving a small sample of fresh meat for moisture study. In the laboratory, the samples were washed with distilled water and cut into cubic proportions of approximately 1 cm with a sterile knife. Handling during cutting was with sterile gloves to avoid contaminating the meat sample.

The meat was freeze-dried in a LABCONCO brand FreeZone 4.5 equipment for 3 days. Subsequently, a food mixer (equipped with a stainless steel blade) was used to ensure the homogeneity of the samples.

Samples were analyzed in triplicate for determination of proximate composition according to methods recommended by the AOAC.[9]

Humidity determination

In an aluminum tray at constant weight, 1 g of sample is added and placed in the oven at a temperature of 60 °C for 24 hours. Once the time was up, it was removed from the oven and placed in a desiccator for 30 minutes (until the sample cooled) and the weight was recorded again on an analytical balance (Precisa brand). The % moisture of the sample is calculated by difference in weights.

Determination of ashes

The method presented here is used to determine the ash content in foods by calcination. It is considered as the content of total minerals or inorganic material in the sample.

Three crucibles were placed at constant weight, after recording the weight of the crucible, 1 g of sample was added, and it was placed on a grill so that it lost most of the organic matter. When the sample was charred, it was removed from the grill. Afterwards, the crucibles with the carbonized sample are placed in a muffle at 550 °C and left for 4 hours until the sample turns into white ashes. Once the ashes are obtained, the crucible with the sample is removed and placed in the desiccator until they are cold. The weight is recorded again on an analytical balance and the % ash is calculated based on the difference in weight.

Protein determination

Due to its cost, this is one of the most important nutrients in a commercial operation; Its adequate evaluation allows us to control the quality of the protein inputs that are being acquired or the food that is being supplied. Its analysis is carried out using the Kjeldahl method,[10] which evaluates the total nitrogen content in the sample, after being digested with sulfuric acid in the presence of a mercury or selenium catalyst.

Add 0.7 g of sample to a Kjeldahl flask, add 0.7 g of mercury oxide, 15 g of potassium sulfate and 30 ml of concentrated sulfuric acid. Heat vigorously until the digestion mixture is clear. It is allowed to cool in the Kjeldahl protein extractor equipment (Novatech brand) until the gases cease.

Add 200 ml of distilled water and 25 ml of thiosulfate solution and mix. Carefully let 100 ml of 45 % sodium hydroxide fall down the wall of the flask to make the contents strongly alkaline and do not stir until it boils for distillation. The distillation flask is connected and the digestion solution is heated to boiling; The distillate is collected in an Erlenmeyer flask, which should have 100 ml of 0.1 N hydrochloric acid or boric acid with 5 drops of methyl red as an indicator. The hose where the distillate will pass must be completely submerged in the acid of the flask, since the ammonia can evaporate. The distillation is completed until at least 150 ml have been distilled into the receiving flask. All distillate in the Erlenmeyer flask must be titrated with 0.1 N NaOH if the distillate is collected with Hydrochloric acid or titrated with 0.1 N HCl if the distillate is collected with boric acid.

Fat Determination
In this method, the fats in the sample are extracted with petroleum ether and evaluated as a percentage of the weight after evaporating the solvent.

The Soxhlet method was used to extract the fat.[(11)] 2 g of sample were weighed and placed in an extraction cartridge, placing a cotton swab on top of the sample to prevent the solvent from falling directly into the sample.

The cartridge is placed inside the trap, 150 ml of petroleum ether is added to each ball flask, then the flask is heated to boiling (80 ºC) of the solvent for a period of 5 hours. Once the time has elapsed, the cartridge is removed. extraction cartridge.

The ball flasks are taken with tongs and gloves so as not to add fat that would affect the calculation. These are dried in an oven at 60 ºC for a few hours and finally the ether extract is determined by difference in weights.

Extraction of vitamins A and E.
In a ball flask, 5 g of sample, 50 ml of methanol, 0.25 g of ascorbic acid and at the end 5 ml of 50 % potassium hydroxide were placed. The flask was then covered with aluminum foil (to avoid exposure to light). It is then placed in a water bath on a heating plate with stirring at 85 °C for 45 minutes. Afterwards, it is allowed to cool to room temperature and is washed. Once the samples are obtained, they are stored at -4 °C for reading on the HPLC.

Vitamin D extraction.
In a ball flask, 8 g of sample, 50 ml of methanol, 1g of ascorbic acid, 50 ml of distilled water and finally 12 g of potassium hydroxide are placed, then the flask is covered with aluminum foil (to avoid exposure to light), then it is placed in a water bath on a heating plate with stirring at 85 °C for 45 minutes. Afterwards, it is allowed to cool to room temperature for 5 minutes and is washed.

Three washes are carried out with HPLC grade hexane and three with distilled water.

Once the washes with water are finished, the sample is filtered in a Kitasato flask connected to a vacuum with sodium sulfate. The filtrate is placed on a rotary evaporator with 5 mg of BTH at a temperature of 40 °C at 80 revolutions per minute. Finally, the sample is placed in an amber vial and refrigerated for reading on HPLC.

Determination of vitamins A, E and D.
For vitamin quantification, an HPLC equipment (Agilent Technologies 1260, Waldbronn, Germany) equipped with a diode array detector (DAD) and an Agilent Zorbax Extend C18 column (250 mm x 4.6 mm x 5 mm) was used. The mobile phase was methanol:water 95:5 (v/v) with a flow rate of 0.5 ml/min. The detection wavelength was between 280-330 nm. Quantification was carried out with calibration curves for each vitamin.

DISCUSSION OF RESULTS
The nutritional composition of meat from game animals shows wide variability, which is determined by various factors such as species, age, sex and diet. This makes a global evaluation of the nutrient contribution obtained by consuming this type of meat difficult. However, in general, wild animals share distinctive characteristics that differentiate them from farmed animals. For example, they tend to have a lower fat content due to the low presence of intramuscular fat, especially in young animals. This low amount of fat contributes to a higher percentage of proteins, which are of high biological value.

Muscle contains approximately 75 % water and 25 % protein along with a variable amount of fat, as well as a small percentage of mineral elements and some vitamins.[12]

Meats that have a protein content between 15 % and 20 % are considered good quality. The proportion of fat ranges between 5 % and 40 %, which depends on the type and breed of the animal, as well as its diet and age. Most of the calcium present in an animal organism is concentrated in the bones, which implies that the edible portion of meat has a low presence of this mineral. Lean muscle cuts represent an excellent source of iron and phosphorus. The water content in lean meat is around 75 %.[13]
The following table shows that black iguana meat has a fat percentage of 4.6 %, so we can say that it has a low percentage of this nutrient compared to some commonly used meats.

According to the author Arenas de Moreno[14] in his proximal study of meat he cites that chicken meat contains 7.75 ± 0.12 of fat and beef 2.57 ± 0.20 of fat, consequently, we can say that iguana meat is a food with lower fat content than chicken.

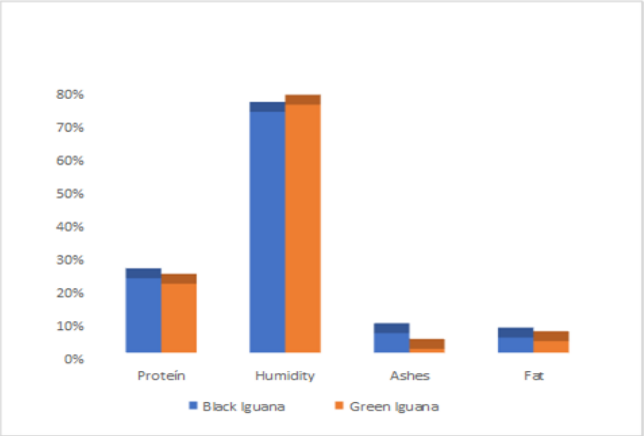
Table 1. Bromatological properties of the black iguana.

Bromatological properties	Percentage
Proteín	22.4 %
Humidity	72.5 %
Ash	5.9 %
Fat	4.6 %

The black iguana shares many of the physical, anatomical, physiological and behavioral characteristics of the green iguana, although with significant differences.[15]

If we compare the results that we obtained in the meat of the black iguana (Ctenosaura pectinata) with the data obtained by Arenas de Moreno[14] for the green iguana

(Iguana iguana), we observe similar quantities in three of the parameters studied. (Graph 1).



Graph 1: Comparison of various components between the black iguana and the green iguana.

The values obtained by Macías-Villamizar [16] in the green iguana are a little lower in the case of protein 19.8 %, ash 1.6 % and fat 4.5 %, but a little higher in the percentage of humidity 77.2 % data close to the obtained by our research group for the black iguana.

Vitamins A, E and D are essential components for maintaining optimal health in humans. These vitamins play critical roles in various biological processes and are essential for the proper functioning of the body. Although found in a variety of foods, chicken, beef, and pork also provide modest amounts of these important vitamins.

Vitamin A, known for its role in vision, immunity and skin health, is present in small amounts in these meats. For its part, vitamin E, a crucial antioxidant for protecting cells against oxidative damage, is also present in moderate amounts in these food sources.

As for vitamin D, which plays an essential role in bone health and calcium absorption, its presence in chicken, beef and pork is limited, unless it has been fortified or specific parts of the meat are consumed. animal, such as the liver.

Although the meats mentioned can provide certain amounts of these vitamins, it is important to note that they are not the richest or most effective sources to obtain a significant intake of them. In general, a balanced and diversified diet that includes a variety of nutrient-dense foods will provide a solid foundation to ensure adequate intake of these essential vitamins.

In black iguana meat we found modest amounts of vitamins A and E, while vitamin D was not detected by the method used (Table 2).

Table 2: Vitamin A and E present in black iguana meat.

Vitamin	µg/100 g
A	244
E	1013
D	ND

In the previous table we can see that black iguana meat has considerable amounts of vitamin E (tocopherol), taking into account that it is a food of animal origin since the main sources of this nutrient in people's diets are foods of animal origin. vegetable and fish.

Vitamin A (retinol) is found in foods of animal origin but is generally located in organs such as the liver, kidney and lung.[17]

In Figure 1 we present a chromatogram where the peaks of retinol and tocopherol are observed with a retention time of 10.53 and 19.94 for vitamin A and vitamin E respectively.

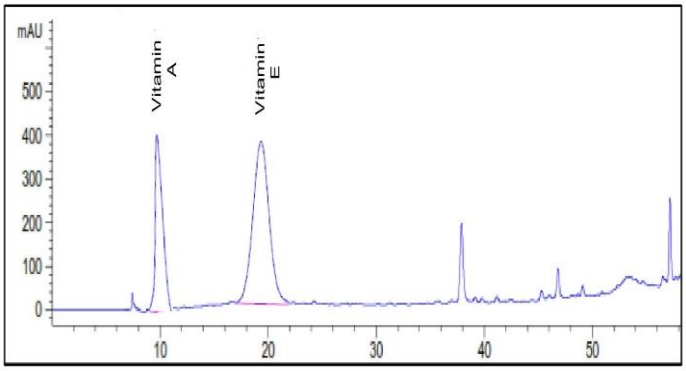
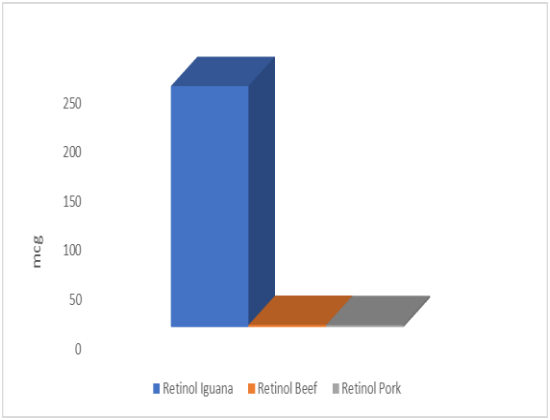


Figure 1: Chromatogram of vitamins A and E in black iguana meat: Retention time 10.533 = Vitamin A (retinol); retention time 19,947 = vitamin E (tocopherol).

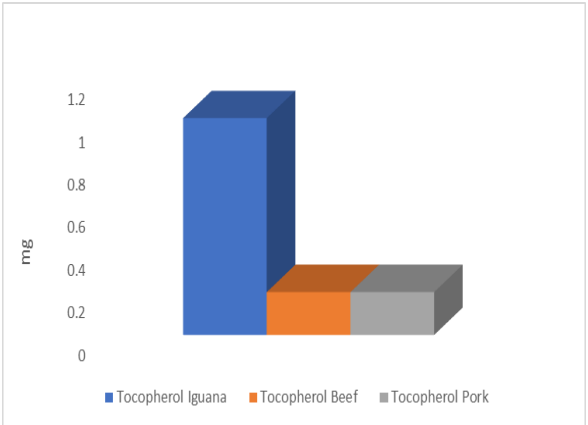
The amount of vitamins A, E, and D in red meat can vary depending on the specific type of meat and preparation, but in general, red meat is not a significant source of these vitamins compared to other foods.

If we compare the amount of retinol in black iguana meat with beef and pork, we find significant differences (Graph 2).



Graph 2: Comparison of retinol content in black iguana, beef and pork meat.

Likewise, we observed that the tocopherol content in iguana meat is considerably higher than in beef and pork (Graph 3).



Graph 3: Comparison of tocopherol content in black iguana, beef and pork meat.

The content of fat-soluble vitamins is very variable, since their quantity depends on factors such as age, sex, diet and area of the carcass.

Meats are an important source of B complex vitamins, including: thiamine, riboflavin, niacin, vitamin B6 and B12. In addition, it is an important source of vitamin E. They are not an important source of folic acid, but it contains biotin and pantothenic acid. Lean meat contains

very little vitamin A, necessary for the maintenance of tissues and vision. Meats have practically no vitamin D and ascorbic acid. The liver is an important source of vitamin A, D and K.[18]

CONCLUSION

The black iguana is consumed by a large part of the rural Mexican population in order to remedy some disease, in the mountain communities they consume it as another source of food, based on this it was of great interest to us to analyze the content of fat-soluble vitamins from the meat of the black iguana (Ctenosaura pectinata). Based on these results we can conclude that iguanal meat can be a complement to the diet, however, the consumption of this species must be done rationally, that is, supported by research centers and the corresponding authorities, since consumption intensive would endanger the preservation of the species.

BIBLIOGRAPHY

1. Raúl Andrés Perezgrovas y Eréndira Jacqueline Sedano Quirarte. Estudios sobre la fauna silvestre de México y las interacciones Humano-animal. Printed in Mexico, 2019.
2. Raúl Valle Marquina, Alejandro García Flores, Hortensia Colín Bahena. Revista Peruana de Biología, 2021; 28 (4).
3. Mariana Zarazúa-Carbajal, Michelle Chávez-Gutiérrez, Yessica Romero-Bautista, Selene Rangel-Landa, Ana Isabel Moreno-Calles, Luis Fernando Alvarado Ramos, Sandra E. Smith, José Blancas, Ek del Val, María del Coro Arizmendi y Alejandro Casas. Journal of Ethnobiology and Ethnomedicine, 2020; 16 (4).
4. Leonor Solís and Alejandro Casas. Journal of Ethnobiology and Ethnomedicine, 2019; 15 (58).
5. Jesús García-Grajales, Carlos Alberto Luis-Curiel, Alejandra Buenrostro-Silva. Acta Zoológica Mexicana, 2022; 38.
6. María del Rosario Jacobo-Salcedo, Ángel Josabad Alonso-Castro, Alicia Zarate-Martínez. Journal of Ethnopharmacology, 2011; 133.
7. Víctor H. Luja, Jesús A. López, Raciel Cruz-Elizalde, Aurelio Ramírez-Bautista. Nature Conservation, 2017; 21.
8. Edgar Oviedo-Hernández, Gabriel Andrade-Soto and Oswaldo Hernández-Gallegos. Revista Latinoamericana de Herpetología, 2022; 05: 04.
9. ME Zurita-Carmona, BC Aguilar-Valdez, A González-Embarcadero, GD Mendoza-Martínez, JL Arcos-García. Universidad y Ciencia, 2009; 25(1): 103-109.
10. José Luis Arcos-García, Víctor Hugo Reynoso Rosales, Germán David Mendoza Martínez, David Hernández Sánchez. Vet. Méx, 2005; 36(1): 53-62
11. José Luis Arcos-García, Mario Antonio Cobos Peralta, Víctor Hugo Reynoso Rosales, Germán David Mendoza Martínez, María Esther Ortega Cerrilla, Fernando Clemente Sánchez. Vet. Méx, 2002; 33(4): 409-419.
12. ASSOCIATION OF OFFICIAL ANALYTYCAL CHEMISTS (AOAC). Official methods of analysis. 15 th ed. Washington D. C, 1990; 15.
13. Purificación Sáez-Plaza, Agustín García Asuero, Julia Martín, An Real Acad Farm, 2019; 85, 1: 14-19.
14. Valeria Velasco, Victoria Vera, Fernando Bórquez, Pamela Williams, Manuel Fúndez, Julio Alarcón-Enos. Chilean J. Agric. Anim. Sci., ex Agro-Ciencia, 2019; 35(3): 261-266.
15. Fox, B. y Cameron, A. Ciencia de los alimentos, nutrición y salud. México, Ed. Limusa, 1999; 11, 12, 41, 57, 113, 185, 212-215, 325, 330, 369-378.
16. Charley, H. 1989. Preparación de Alimentos: su tecnología. México, Ed. Limusa, 519, 520, 553, 567, 574.
17. Arenas de Moreno, Argelis Vidal, Huerta-Sánchez, Yannellys Navas, Uzcátegui-Bracho, Huerta-Leidenz. Archivos Latinoamericanos de Nutrición, 2000; 50: 7.
18. Arcos-García, J.l, Cobos; Reynoso,R.; Mendoza, M.G. Ortega, C.M.E.; Clemente. Rev. Vet. Méx, 2002; 33(4): 409-419.
19. Macías Villamizar V. Duazary, 2007; 4, (1): 31-37.
20. Rabia Shabir Ahmad, Ali Imran y Muhammad Bilal Hussain. Ciencia y nutrición de la carne. Ed. InteChopen, 2018.
21. Carvajal S. G. Valor nutricional de la carne de: res, cerdo y pollo. Corporación de fomento ganadero, 2001.