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KINETIC OF DIFFUSION OF IRON AND VITAMIN B12 DURING COOKING OF CANE RAT OFFAL

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ABSTRACT
The study of the evolution of vitamin B12 and iron levels in offal cooked at different cooking levels highlights the importance of the way foods are prepared to preserve their nutrient content. In order to study the diffusion of iron and vitamin B12 during the cooking of grasscutter offal, we collected 6 samples of grasscutter offal, which we divided into 3 batches for iron and 3 batches for vitamin B12. This distribution made it possible to measure the impact of different variables on the levels of these nutritional elements in the offal. The dosage is carried out every 5 minutes for 1 hour. The results show that vitamin B12 is sensitive to heat, with a significant decrease in its concentration during prolonged cooking at high temperatures. On the other hand, iron seems to be more stable and retains its content better, even after prolonged cooking. This difference in nutrient response to heat highlights the importance of choosing appropriate cooking methods to maximize the nutritional value of foods.

KEYWORDS: Vitamine B12, Iron, Diffusion, Abats.

I. INTRODUCTION
Thryonomys is a genus of large rodents called "reed rats", from the family Thryonomyidae.[1] This genus includes two species, the large and the small aulacode. In Africa, the Greater aulacode is a farm animal that provides highly appreciated meat. The female is called aulacodine, the young of the aulacodeaux. The breeding of these animals is called aulacodiculture.[2] Scientifically known as Thryonomys swinderianus, the cane rat is a rodent found in grassy savannahs, clearings and wetlands or marshes in Africa. A fast-growing animal, the cane rat is sexually mature from 5 months. Hardy and easy to raise, its domestication enhances agricultural by-products. The flesh and offal of the cane rat are highly prized in Ivory Coast.[3] The offal of the cane rat, far from being considered as by-products, is considered as essential elements determining the market value of the animal. Offal, often referred to collectively as tripe or tripe products. Offal is rich in protein, iron and especially vitamin B12.[4] However, during cooking, a loss of minerals and vitamins is observed. Among these minerals and vitamins, we find iron and vitamin B12, which are two essential nutrients in hematopoiesis and the prevention of anemia. However, controlling the cooking process could prevent losses of iron and vitamin B12.[5] In Côte d'Ivoire, very few studies have been devoted to the diffusion of nutrients during the cooking of cane rat offal. However, this offal is widely consumed in Côte d' Ivoire.[6] It therefore appears necessary to fill this gap in scientific data on the kinetics of diffusion of minerals and vitamins of nutritional interest during the cooking of grasscutter offal. This study is part of this framework with two specific objectives.

- Evaluate the level of diffusion of iron during cooking.
- Evaluate the level of diffusion of vitamin B12 during cooking

II. MATERIAL AND METHOD
II. 1. 1 Biological material
The biological material consists of a cane rat captured in Biakalé, a village in the department of Man.

Figure 1: Photograph of a cane rat.

It consisted of standard aulacode capture equipment and laboratory equipment. Standard laboratory equipment includes precision balances, pipettes, test tubes, a centrifuge, and a spectrophotometer. In addition, an automatic cooker with three power levels was used to cook the aulacode offal. Finally, chemical reagents were needed to determine the iron and vitamin B12 content.

II. 2 METHODS

II. 2.1 Sampling and experimental design

In order to study the diffusion of iron and vitamin B12 during the cooking of aula code offal, we took 6 samples of aula code offal, which we divided into 3 batches for iron and 3 batches for vitamin B12. This distribution made it possible to measure the impact of different variables on the levels of these nutritional elements in organ meats. The dosage is carried out every 5 minutes for 1 hour, which allows for regular and accurate measurements throughout cooking. This method will allow us to observe how the levels of vitamin B12 and iron change according to the cooking time and the level of heat applied. The different cooking phases, represented by the heat levels (P1: LOW HEAT, P2: MEDIUM HEAT, P3: HIGH FIRE), make it possible to analyze the effect of heat intensity on the levels of these nutrients. It can be anticipated that vitamin B12 and iron levels will vary depending on the heat, with low heat likely to result in less nutritional loss than large fire. In conclusion, this sampling and dosing methodology will allow for an in-depth assessment of the impact of cooking on vitamin B12 and iron levels in organ meats. This study may have important implications for the preparation and consumption of organ meats as a source of essential nutrients.

II. 2.2 Determination of iron and vitamin B12 in cane rat offal

II. 2.2.1 Determination of iron

Sample preparation required the accurate weighing of a sample of grasscutter offal (5g) in a clean test tube. Then 5 ml of a hydrochloric acid solution was added to digest the samples and release the bound iron. The iron content was determined by means of a calibration curve.

II. 2.2.2 Determination of vitamin B12

For vitamin B12, 5g of organ meats were taken from a clean test tube. Then 5 ml of solvent was added to extract vitamin B12 from the samples. Then, it was necessary to inject the extracted samples into the HPLC system and separate the vitamin B12 from the other compounds present in the sample. Then it was necessary to measure the area under the curve corresponding to vitamin B12 in the chromatograms and use a calibration curve to calculate the concentration of vitamin B12 in the samples.

I. RESULTS AND DISCUSSION

III. 1. Results

III. 1.1. Iron content

The results of monitoring iron content during cooking are shown in Figure 2. The results showed that the iron concentration in the cooking water changes gradually regardless of the cooking power. However, we can see that the diffusion is greater with the P3 power level with 2.41 mg/100g in one hour.

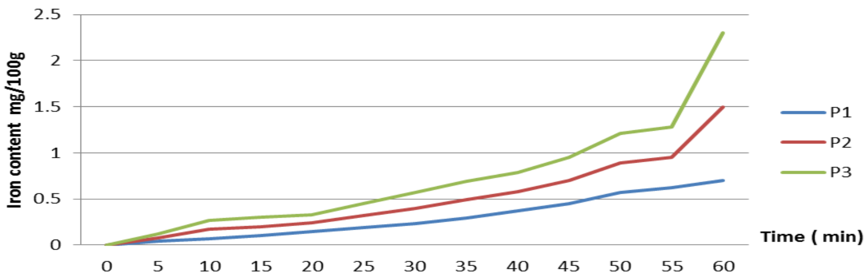

Figure 2: Graph of the variation in iron content as a function of time with different cooking methods.

III. 1.2 Vitamin B12 content

The vitamin B12 diffusion study has shown that vitamin B12 levels increase before gradually decreasing with cooking time. In addition, this decrease is greater with a higher cooking fire Fig 3.

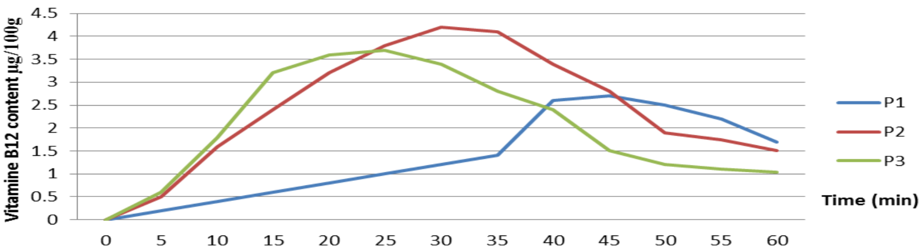

Figure 3: Graph of the variation in vitamin B12 content as a function of time according to different cooking methods.

III. 2. DISCUSSION

The general objective of this work is to study the diffusion of iron and vitamin B12 during the cooking of grasscut offal. The results obtained concerning the diffusion of iron during cooking for a certain period of time at three different cooking levels (P1: low heat, P2: medium heat and P3: high heat) showed significant variations depending on the type of cooking. This is because cooking over low heat P1 resulted in minimal iron loss, while cooking over high heat P3 led to a larger loss. These results are in agreement with previous work conducted by various authors in the field of nutrition.[7,8] By comparing our results with those of an author working on a similar topic, such as the impact of cooking on the nutrient content of food, it is possible to highlight similarities and discrepancies that enrich the understanding of the mechanisms at play. This comparison confirms the validity of our results and adds nuance to the conclusions drawn from our study. As for vitamin B12, the results showed similar variations to those of iron depending on the cooking method. Cooking over low P1 heat preserved the vitamin B12 content more compared to cooking over medium P2 and high P3 heat. These observations are in line with current knowledge about vitamin B12's sensitivity to heat and other environmental factors.[9] The analysis of the results of the dosage curves of vitamin B12 and iron levels in offal cooked at different cooking levels allows several important conclusions to be drawn. First, vitamin B12 is found to be more sensitive to heat than iron, resulting in a significant decrease in its concentration with a longer cooking time and higher heat.[10,11] Thus, it is crucial to choose gentle cooking methods to preserve the vitamin B12 content of foods as well as possible, especially foods rich in this vitamin such as organ meats. In contrast, iron levels are relatively stable during cooking, suggesting that iron is less impacted by heat than vitamin B12. This indicates that iron retains its iron content well even after prolonged cooking, which is good news for those who are looking for a source of iron in their diet.[12] Combining these findings, it is clear that each nutrient reacts differently to heat and cooking, highlighting the importance of choosing appropriate cooking methods to preserve the nutrients in food. These findings can guide food choices and food preparation methods to optimize the nutritional value of the daily diet.

IV. CONCLUSION

The study of the evolution of vitamin B12 and iron levels in offal cooked at different cooking levels highlights the importance of the way food is prepared to preserve its nutrient content. The results show that vitamin B12 is sensitive to heat, with a significant decrease in its concentration during prolonged cooking at high temperatures. On the other hand, iron seems to be more stable and retains its content better, even after prolonged cooking. This difference in the reaction of nutrients to heat highlights the importance of choosing suitable cooking methods to maximize the nutritional value of food.

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