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**EVALUATION OF THE IRON CONTENT OF PLANTS PROPOSED  
AGAINST ANEMIA BY TRADITIONAL PRACTITIONERS OF  
BIANKOUMA, COTE D'IVOIRE**

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**ABSTRACT**

Anemia is a public health problem in Côte d'Ivoire and especially in Biankouma, a city in the west of the country. To contribute to the search for a cure for the disease, this study was undertaken in the city. It makes an inventory of the plants proposed by traditional practitioners and evaluates the iron content in the organs of plants to seek the scientific bases of the traditional use of these plants. The study made it possible to inventory 15 plants belonging to 17 botanical families with a dominance of Fabaceae. The parts of the plants used as phytomedicines are: leaves, leafy stems and leafy branches. These plant organs are prepared by two techniques: decoction and paste. The decoction is administered as a drink and the paste is to be consumed. Concerning the mineralogical analysis, it revealed that five plants are rich in iron as *Piper guineense*, an anti-anemic plant known in the south of Côte d'Ivoire. These plants are: *Corchorus olitorius*, *Khaya senegalensis*, *Piper longum*, *Piper umbellatum* and *solanum torvum*. The other 10 plants, although less rich in this mineral than *Piper guineense*, cover a person's daily iron needs. All the plants proposed by the

traditional practitioners of Biankouma could therefore combat anemia because iron is an essential element of the hemoglobin molecule.

**Keywords: Anemia, iron, plant, Biankouma, Côte d'Ivoire**

## 1. INTRODUCTION

Anemia is one of the public health problems, affecting both developed and developing countries. It is a disease characterized by a red blood cell count or a red blood cell hemoglobin level below normal [1]. It mainly affects women and children. The threshold used to define anemia is a hemoglobin level below 110g/L [2]. In Côte d'Ivoire, it is a major cause of morbidity and mortality [3]. Iron deficiency is the main cause of anemia [4]. In 1997, iron deficiency was 35% in children and 45% in pregnant women in the country. In 2007, 10 years later, it was 50% in children and 58% in pregnant women [5]. Today, the country's health authorities estimate these iron deficiencies at 60% in children and 67% in pregnant women. In Biankouma, the site of this study, despite the efforts of the Ivorian government, these rates are estimated at 68% in children and 72% in pregnant women with 90% of cases of iron deficiency anemia [6]. This high rate of

anemic people is explained by the scarcity of health centers in the region and the high cost of pharmaceutical products. Faced with this alarming health situation, the city's traditional healers are regularly called upon. However, do the plants proposed against anemia by these traditional healers have anti-anemic properties? This study addresses this problem. It lists the plants proposed by the traditional healers of Biankouma against anemia and seeks the scientific basis for their use by measuring their iron content. It is therefore a contribution to the search for plants with anti-anemic properties.

## 2. MATERIALS AND METHOD

### 2.1. Presentation of the study environment

Biankouma is a city in western Côte d'Ivoire (**Figure 1**). It is located 700 km from the city of Abidjan (economic capital of the country) with the geographical coordinates of 7°44'00''N latitude and 7°37'00''W longitude.

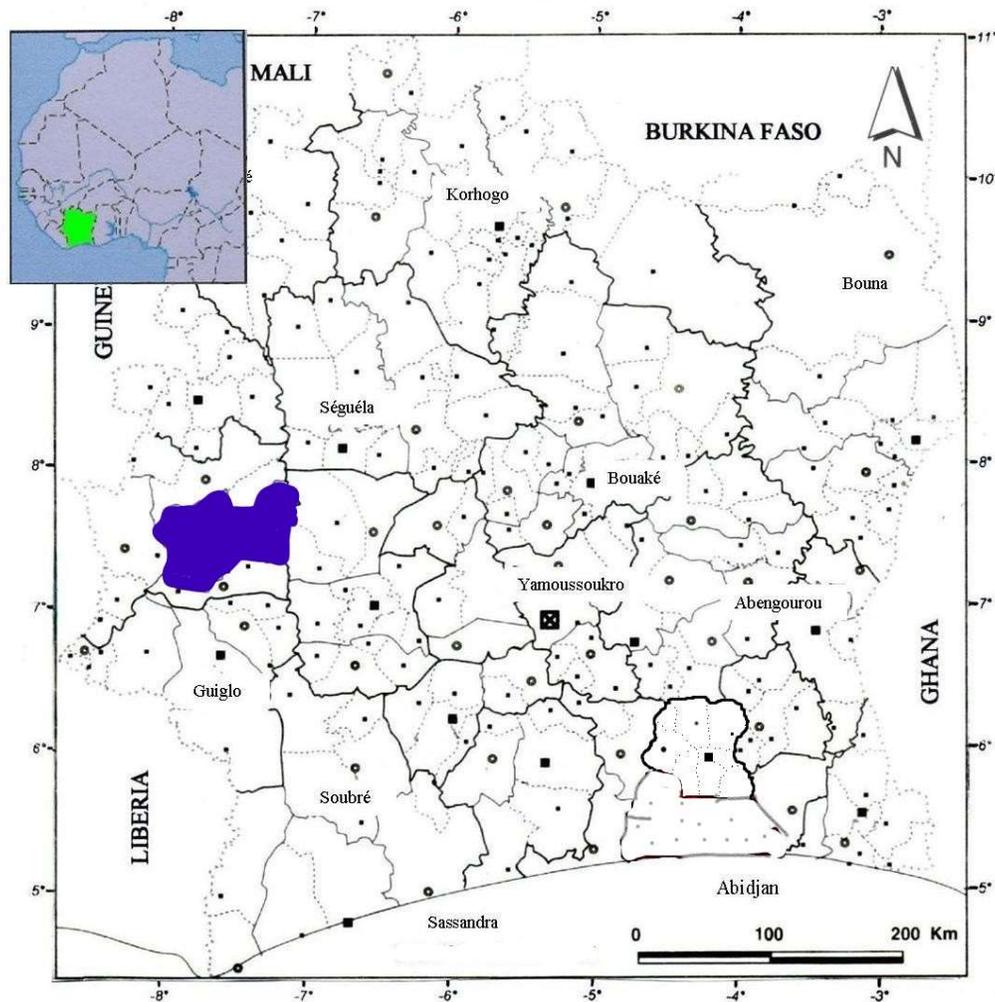


Figure 1: Location of Biankouma in Côte d'Ivoire and Africa

## 2.2. Survey material

The biological material includes all the plants and plant organs encountered among traditional practitioners. The technical material consists of a survey sheet containing the questionnaires, a pruning shears for collecting plant samples, plastic bags and old newspapers for storing samples. A digital camera and laptop for images, data entry and analysis.

## 2.3. Mineralogical analysis material

The dried leaves of the inventoried plants constituted the plant material. The assessment of the iron content required the use of various tools from the central laboratory of the University of Man: an electric grinder, a digital scale, an electric grinder, a muffle furnace, a spectrometer connected to a desktop computer that displays the iron contents.

## 2.4. Method of the ethnopharmacological survey

The surveys were carried out in the city of Biankouma for 6 months (February-August 2024). A hundred traditional practitioners registered at the city hall were contacted and questioned on the plants used in the treatment of anemia. The questionnaire related to the plants and plant organs proposed against anemia, the preparation techniques and the method of administration of the drugs. Samples of the indicated plants were collected for identification of the scientific names at the

laboratory of the University of Man (Côte d'Ivoire). The identification was done by the botanical team of the said institution.

### 2.5. Mineralogical analysis method

The iron dosage was carried out in the plant organs proposed by the traditional practitioners against anemia. The determination of iron contents was carried out by dry method according to the protocol of the central laboratory of the University of Man, Côte d'Ivoire (**Figure 2**).

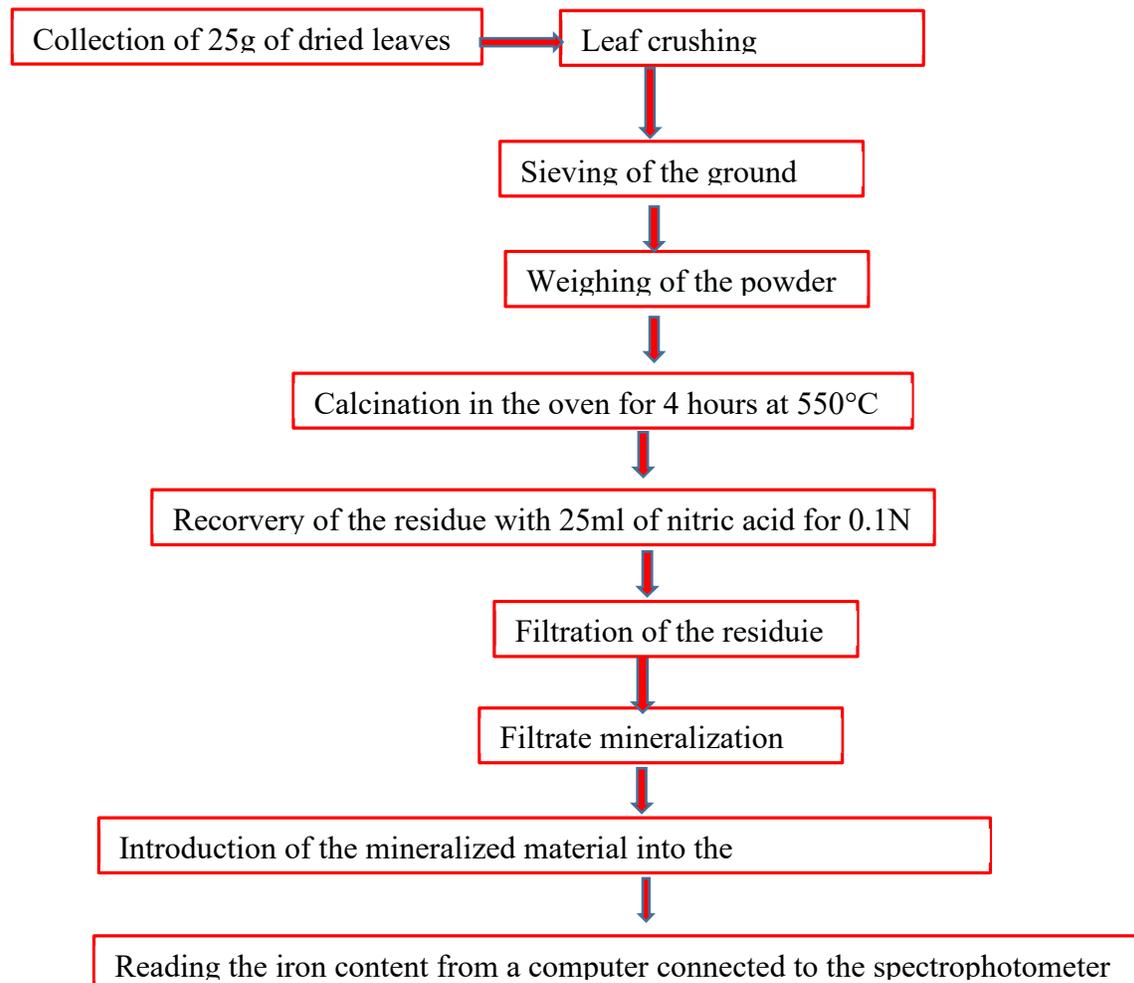


Figure 2: Protocol for assaying iron contents by dry method

## 2.6. Statistical analysis of mineralogical data

The iron contents of the different plant extracts were compared by the one-way Anova test coupled with the complementary Tukey test. The iron contents of organs from the inventoried plants were compared to that of *Piper guineense* whose leaves effectively combat anemia in the south of Côte d'Ivoire

[7]. The leaves of this reference plant were analyzed under the same conditions as the inventoried plants.

## 3. RESULTS AND DISCUSSION

### 3.1. Plants proposed against anemia by traditional practitioners of Biankouma

The plants proposed by traditional practitioners of Biankouma are listed in **Table 1**.

Table 1: List of inventoried plants and therapeutic indications

Plants	Botanical families	Organs or parts of plants used	Preparation techniques	Method of administration
<i>Abrus camescens</i>	Fabaceae	leaves	Decoction	Drink
<i>Acacia mangium</i>	Fabaceae	leaves	Decoction	Drink
<i>Bambusa vulgaris</i>	Poaceae	Leafy branch	Decoction	Drink
<i>Corchorus olitorius</i>	Malvaceae	Leafy stem	Dough	Dining
<i>Costus afer</i>	Costaceae	Leavy branch	Decoction	Drink
<i>Hellenia speciosa</i>	Costaceae	Leavy branch	Decoction	Drink
<i>Irvingia gabonensis</i>	Irvingiaceae	Leaves	Decoction	Drink
<i>Keetia mannii</i>	Rubiaceae	Leafy branch	Decoction	Drink
<i>Khaya senegalensis</i>	Meliaceae	Leaves	Decoction	Drink
<i>Kleinhovia hospita</i>	Malvaceae	Leaves	Decoction	Drink
<i>Lasia spinosa</i>	Araceae	Leafy stem	Dough	Dining
<i>Piper longum</i>	Piperaceae	Leafy stem	Dough	Dining
<i>Piper umbellatum</i>	Piperaceae	Leafy stem	Dough	Dining
<i>Piptadeniastrum africanum</i>	Fabaceae	Leaves	Decoction	Drink
<i>Solanum torvum</i>	Solanaceae	Leaves	Dough	Dining

The table shows 15 plant species belonging to 17 botanical families with a dominance of Fabaceae (3 species), Piperaceae (2 species) and Costaceae (2 species). The parts of the plants used in medicinal recipes are: leaves (46.66%), leafy stems (26.66%) and leafy branches (26.66%). These plant organs are prepared by two techniques: decoction and paste. The decoction is administered as a drink and the paste is to be consumed.

Three plant species in this list have already been indicated as anti-anemic plants in the literature. These are *Corchorus olitorius* [8], *Khaya senegalensis* [9] and *Solanum torvum* [10]. The other twelve plants are revealed by the present study. This testifies to the contribution of this study in the search for effective medicinal plants against anemia.

### 3.2. Iron content assessment

The assessed iron contents are reported in **Table 2**.

Table 2: Iron content of plant organs in 100g of dry plant matter

Plants	Part of plants analysed	Iron contents mg/100g
<i>Abrus camescens</i>	leaves	164.80±0.13 <sup>b</sup>
<i>Acacia mangium</i>	leaves	59.29±0.16 <sup>c</sup>
<i>Bambusa vulgaris</i>	Leafy branch	49.02±0.01 <sup>c</sup>
<i>Corchorus olitorius</i>	Leafy stem	580.04±0.12 <sup>a</sup>
<i>Costus afer</i>	Leavy branch	36.83±0.14 <sup>c</sup>
<i>Hellenia speciosa</i>	Leavy branch	180.02±0.03 <sup>b</sup>
<i>Irvingia gabonensis</i>	Leaves	120.08±0.01 <sup>b</sup>
<i>Keetia mannii</i>	Leafy branch	33.24±0.12 <sup>c</sup>
<i>Khaya senegalensis</i>	Leaves	501.05±0.09 <sup>a</sup>
<i>Kleinhovia hospita</i>	Leaves	27.21±0.11 <sup>c</sup>
<i>Lasia spinosa</i>	Leafy stem	106.05±0.14 <sup>b</sup>
<i>Piper longum</i>	Leafy stem	613.27±0.08 <sup>a</sup>
<i>Piper umbellatum</i>	Leafy stem	580.86±0.13 <sup>a</sup>
<i>Piptadeniastrum africanum</i>	Leaves	28.49±0.03 <sup>c</sup>
<i>Solanum torvum</i>	Leaves	603.36±0.01 <sup>a</sup>
<i>Piper guineense</i> , reference taxon	Leaves	518.35±0.04 <sup>a</sup>

Means assigned different letters in the same column are significantly different for  $p < 0.001$

**Table 2** presents the iron contents of each plant organ analyzed. The results of statistical comparisons are also indicated. Five plants have statistically identical iron content to that of *Piper guineense*, the reference taxon in this study. These are: *Corchorus olitorius*, *Khaya senegalensis*, *Piper longum*, *Piper umbellatum* and *solanum torvum*. As *Piper guineense*, the five plants could combat anemia because iron is an essential element of the hemoglobin molecule [11]. Statistical analysis showed that the other ten plants are less rich in iron than *Piper guineense* for  $P < 0.01$ . Furthermore, the iron requirements of a person vary from 7mg for children (1 to 3 years) to 27mg for pregnant women [12], all these plants have an iron content higher than these recommended values. They can therefore effectively combat cases of iron

deficiency anemia that threaten the population of Biankouma in Côte d'Ivoire. The use of plants inventoried against anemia in traditional medicine could therefore have a scientific proof.

#### 4. CONCLUSION

This study is a contribution to the search for new therapeutics against anemia based on medicinal plants. It made it possible to inventory 15 plants used in traditional medicine of Biankouma (Côte d'Ivoire) belonging to 17 botanical families with a dominance of Fabaceae. The parts of the plants used in medicinal recipes are: leaves, leafy stems and leafy branches. These plant organs are prepared by two techniques: decoction and paste. The decoction is administered as a drink and the paste is to be consumed. In relation to the mineralogical

analysis, the iron contents were evaluated and compared to that of *Piper guineense* which is an anti-anemic plant known in the south of Côte d'Ivoire. Five plants are highly rich in iron as *Piper guineense*, the reference taxon in this study. They are : *Corchorus olitorius*, *Khaya senegalensis*, *Piper longum*, *Piper umbellatum* and *solanum torvum*. The other 10 plants although less rich in iron than *Piper guineense* and the other five, cover the daily needs of this mineral. All the plants proposed by the traditional practitioners of Biankouma could combat anemia because iron is an important element in the production of hemoglobin. The use of these plants against anemia could be scientifically proven. However, in-depth pharmacological tests are desirable to consolidate the results of this study.

## 5. ACKNOWLEDGMENTS

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