Effects of "Garcinia Kola" and "Cola Nitida" on Human Behaviour: Epidemiological Investigation

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Abstract: *The objective of this study was to assess the level of consumption of Garcinia kola and Cola nitida in the Abidjanese population and band place and to investigate the expected effects of the ingestion of our two species on human behaviour. A comparative study between the consumption levels of Garcinia kola and Cola nitida was carried out using a survey carried out from September to December 2015 in two municipalities in Abidjan (Abobo and Cocody) and Sikensi. The data make it possible to identify 1287 men and 513 women in a population of 1800 people, divided into three classes according to age. Age group A1, from 18 to 35 years old; age group A2, from 36 to 55 years old and age group A3 whose age exceeds 56 years old, it appears that the majority of subjects prefer to consume Garcinia kola (62.17%) at the expense of Cola nitida (29.17%). The reasons for consuming Garcinia kola and Cola nitida are respectively pain relief (56%), the Aphrodisiac effect (25.17%), the fight against fatigue (13.17%) and curiosity (5.66%). The satisfaction of the desired effects of human consumption of Garcinia kola and Cola nitida remains very high (78.17%). This study has shown that Garcinia kola and Cola nitida have actions on human behaviour, which is why it is desirable to look for the neurophysiological actions of Garcinia kola and/or Cola nitida on pain, fatigue and the aphrodisiac component in order to control the dose to be consumed.*

Keywords: *Garcinia kola*, *Cola nitida*, Behaviour, Pain, Vigilance, Aphrodisiac

1. Introduction

Behaviour is a reality apprehended in the form of units of observation, acts, the frequency and sequences of which are liable to change; it translates into action the image of the situation as it is elaborated, with its own tools, by the being under study: "behaviour expresses a form of representation and construction of a particular world. » [1]. In psychology, behaviour is characterized by a set of reactions observable in an individual placed in his or her living environment and in given circumstances. The frequent use of mental and spiritual activities is expressed by a certain behaviour, certain acts, a certain attitude towards our fellow human beings [2]. Behaviour is the set of objectively observable reactions that an organism generally equipped with a nervous system performs in response to environmental stimuli, which are themselves objectively observable [3]. In short, these behaviours are the result of stimuli from the environment, but also from the internal environment of an organism. These stimuli can be substances such as drugs, hormones, alcohol, natural biological phenomena such as hunger, thirst, fatigue, and disease. In addition, other substances may induce effects that regulate, correct or treat the source of the behaviour, in order to restore or even eliminate these causes so that the subject can return to his or her initial stable state, or produce behaviour other than those mentioned above. With regard to all these forms of stimuli, responsible for these different behaviours, we proposed, with the help of an epidemiological survey, to compare, on Garcinia kola commonly called "small cola" or "bitter cola" and Cola nitida, the level of consumption and the effect sought by a good part of the Ivorian population, particularly in Abidjan and some surrounding towns.

2. Materials and Methods

2.1 Study population
The surveys conducted from September to December 2017 covered 1800 people, including 1287 men and 513 women, from two communes in the district of Abidjan (Abobo and Cocody) and Sikensi. This workforce is divided into three groups A1, A2 and A3 according to age. Persons between the ages of 18 and 35 belong to group A1. They are beginning to take on responsibilities in society and are more active. Those aged between 36 and 55 belong to group A2, they are adults with various responsibilities: family, socio-professional. The third group, A3, includes those who are referred to as "senior citizens" (56 to 75 years of age), some of whom no longer have great responsibilities and for various reasons such as disability, illness, accidents or old age. Thus, our sample consists of group A1 with 216 men and 76 women, group A2 with 161 men and 75 women and finally group A3 with 52 men and 20 women.

2.2 Study method

A random selection of three communes was carried out in all the Garcinia kola and Cola nitida producing and consuming regions of Côte d'Ivoire's cities. Subjects were selected at random [4]. Indeed, the communes selected at random are segmented into delimited zones that can be explored and constitute the units. The latter are the subject of a random draw. From this draw, the subjects included in this area are questioned within the limits of an imposed quota. In order to carry out this survey, we conducted an epidemiological survey using a simple and precise questionnaire. The structure of this questionnaire parallels the subjects' preference and actual consumption of natural plant products available in Côte d'Ivoire. The questions concern the age, sex and level of consumption of Garcinia kola and Cola nitida, as well as the expected effects. The questions have been translated into local languages for those rural people who did not understand French and whose questionnaire is worded as follows:

1) Gender: M / F ☐
2) How old are you? years old ☐
3) Do you consume Cola (Cola nitida)? ☐
   - Regularly: at least once a day ☐
     Once a week ☐
   - More than once a month ☐
   - Rarely or not at all ☐
4) Do you consume the "little cola" (Garcinia kola)?
   - Regularly: at least once a day ☐
     Once a week ☐
   - More than once a month ☐
   - Rarely or not at all ☐
5) In what form do you usually consume "the little cola"?
   - In alcohol, ☐
   - By chewing directly, ☐
   - differently ☐

Specify:
....

Apart from the fruit, do you use another part of « petit cola»?
   - Sheet ☐
   - Ecorce ☐
   - Root ☐
   - Others ☐

For what purpose? ....……
……………………………………………………………………
6) Were you satisfied : Yes ☐ No ☐
If Yes, what other effects did you experience?
....
If No, what effects did you observe?
....

The processing of the data collected during these surveys was done using a computer, Excel 2016. The information obtained is entered using statistical data acquisition and processing software (STATSOFT STATISTICA V6.1.478.0 EN). This software allows all kinds of groupings to be made, e.g. by sex, age, level of consumption. The results obtained are compared using the null hypothesis test (Chi-square or X2) with a degree of freedom equal to 1. The lower bound of the accepted Chi-square value is 4 for the significance of the differences ([5]). To improve the approximations, we use the X2 with the Yates correction which makes the estimate more conservative [6]. In other words, if Chi-square < 4, the difference is not significant; on the other hand, if Chi-square ≥ 4, the difference is significant and the degree of significance p is set by the risk read from the X2 table for one degree of freedom. Our cut-off value here is: $p \leq 0.05$. This method is well valid in our case where the smallest number, according to age, is 18. In this respect, this method of evaluation can only be used if the number of people is greater than 5 [6].

3. Results

3.1 Evaluation of the level of consumption of Garcinia kola and Cola nitida species in the population by age group and sex in each municipality

The level of consumption of Garcinia kola and Cola nitida among the 1800 people surveyed allows us to distinguish, for the age groups (figure 1), a distribution that shows that the A1 age group with 48.67% of people dominates, then comes the A2 age group with 39.33% of people and finally the A3 age group with 12% of people. For each case of species, some of the subjects do not consume Garcinia kola and Cola nitida at all or rarely consume them. Thus, for the age group from 18 to 35 years, between Cola nitida consumers and Garcinia kola consumers, the difference in consumption level is significant, (X2= 89.07; p< 0, 0001). Similarly, at the level of the A2 age group, the difference between Cola nitida consumers and Garcinia kola consumers is very significant, (X2= 62.88; p< 0.0001). On the other hand, for the third age group, we observe that the difference in consumption level between Garcinia kola consumers and those of Cola nitida is not significant (X2= 3.01; p> 0.05).
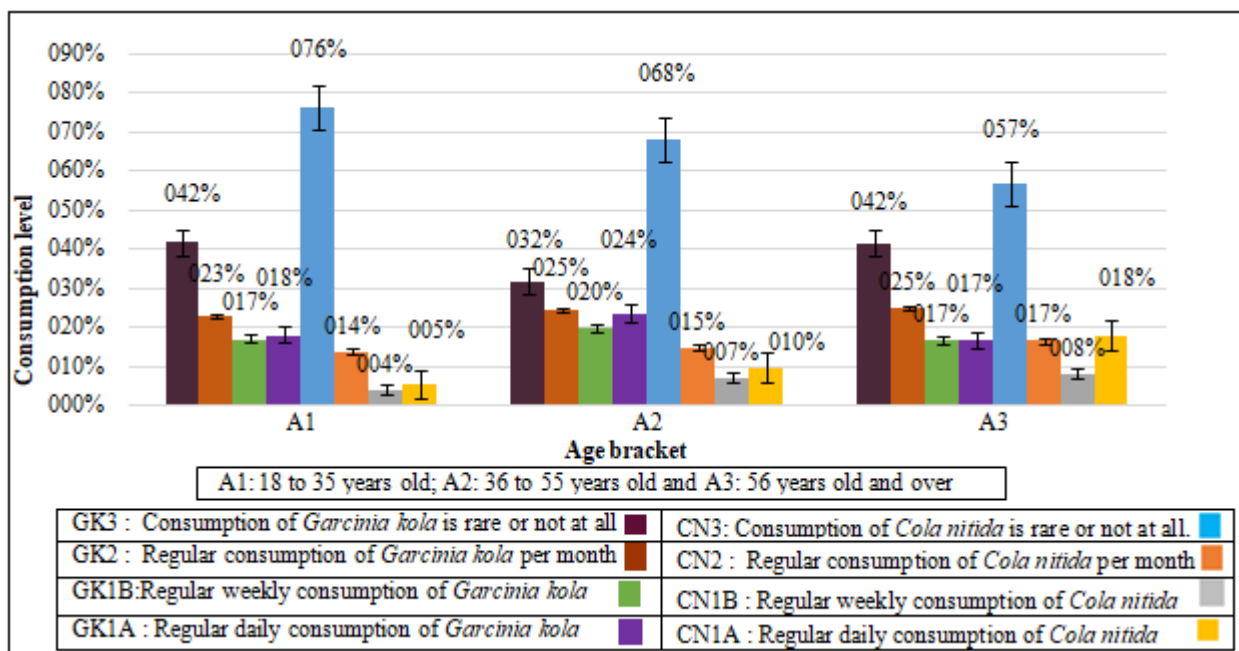

Figure 1: Evaluation of the level of consumption of Garcinia kola and Cola nitida as a function of age

The results at the gender level show that women are less interested in consuming both species. Out of the 1800 people interviewed, we have 513 women, i.e. 28.50%, compared to 1287 men, i.e. 71.50%. It is therefore observed that, between men who consume Garcinia kola and men who consume Cola nitida, the difference in consumption is very significant (X2= 102.97; p< 0.0001). Among women, and the

difference is also significant between female consumers of Garcinia kola and female consumers of Cola nitida (X2= 18.21; p< 0.0001). In summary, there are more women and men who like to consume Garcinia kola than Cola nitida (Figure 2).

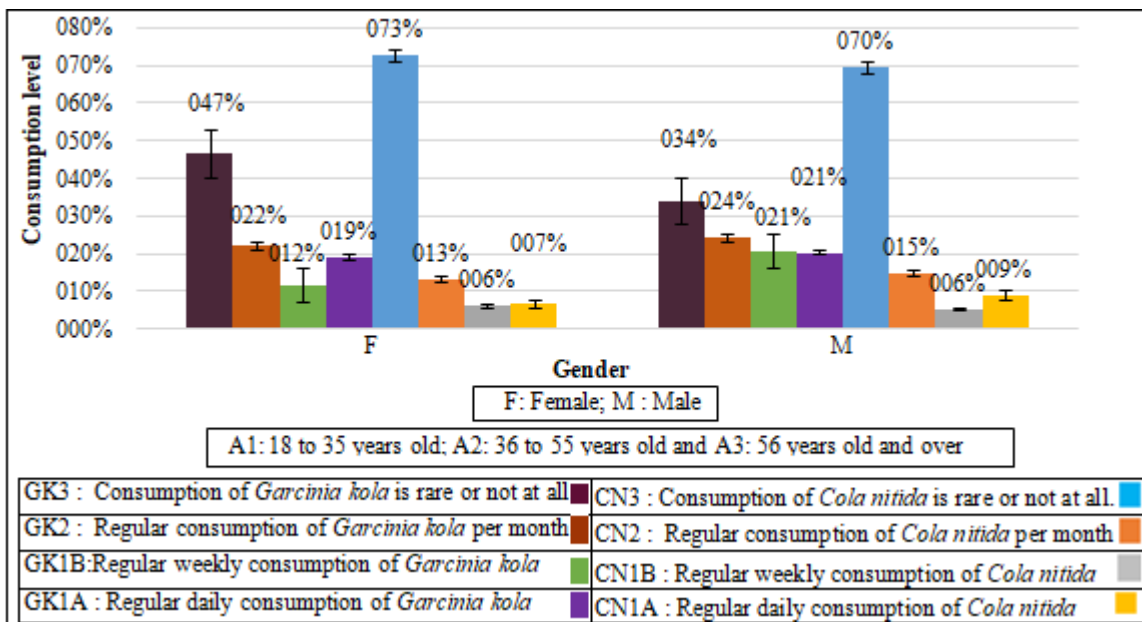**Figure 2:** Evaluation of the level of consumption of Garcinia kola and Cola nitida by gender

3.2 Intended effects in the consumption of the two species Garcinia kola and Cola nitida

It is a question of showing, here, the proportions of people in the consumption of Garcinia kola and Cola nitida, those who are looking for effects against those who consume out of curiosity according to age group, but also according to sex. Thus (figure 18 A), for age group A1, 55.48% of people consume both species to treat pain, 28.08% of people consume for the aphrodisiac effect and 11.64% of people consume for fatigue against 4.79% of people who consume out of curiosity. These values clearly show that the difference is significant in favour of those who consume for the search for effects versus those who consume out of curiosity (X2= 523.07; p< 0.0001). In the A2 age group,

54.66% of people consume both species for the treatment of pain, some (25.42% of people) like to consume for the aphrodisiac effect, others (13.14% of people) do so to fight against fatigue and sleep against 6.78% of people who consume Garcinia kola and/or Cola nitida for curiosity. Here again, the difference is very significant between effect seekers and the curious (X2= 382.73; p< 0.0001). Similarly for the third age group A3, we have 62.50% of people consuming for pain, 12.50% for the aphrodisiac component and 19.44% for fatigue against 5.56% of these people who consume out of curiosity. Contrary to the first age groups, the difference between those seeking effects and those of curiosity is not significant (X2= 3.49; p> 0.05).
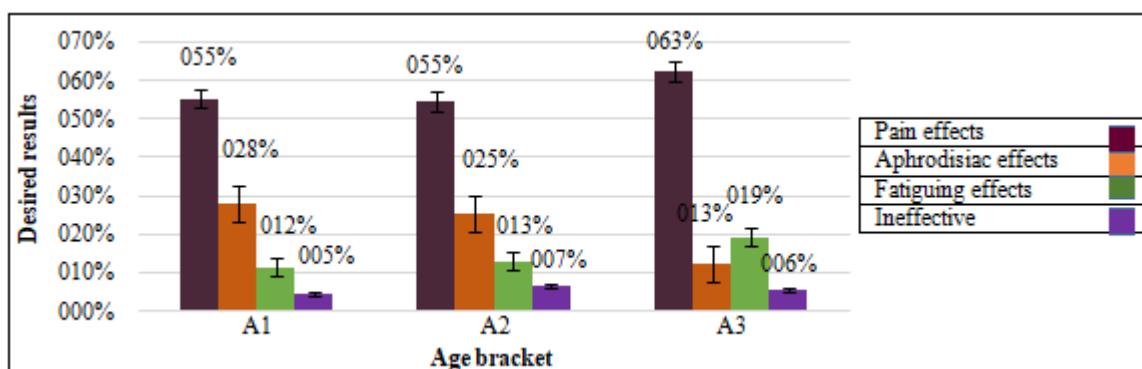

Figure 2: Effets recherchés dans la consommation de Garcinia kola et de Cola nitida en fonction de la tranche d'âge

In addition, this population presents (Figure 18B) by sex,1287 males and 513 females. Thus, among men, 48.95% of men use both for pain treatment, 31.70% use for

aphrodisiacs, 14.69% use for fatigue and sleep, and 4.66% eat out of curiosity. The difference is very significant between consumers in search of effects and the curious (X2=

774.39; p< 0.0001). Among women, the finding is the same. We have 73.68% of consumers for effects of pain; 8.77% for the aphrodisiac effect and 9.36% for cases of fatigue against 8.19% of consumers who consume Garcinia kola and cola

nitida out of curiosity. The difference is very significant between consumers looking for effects and those who consume out of curiosity (X2= 257.51; p< 0.0001).
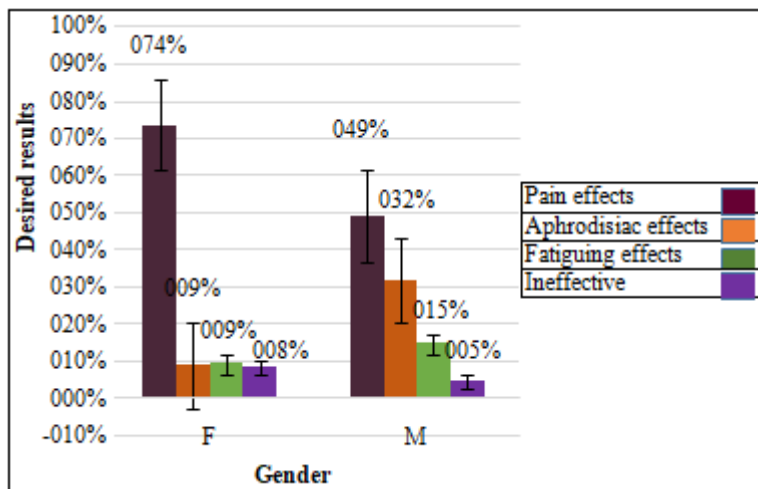

Figure 3: Effet recherchés dans la consommation de Garcinia kola et de Cola nitida en fonction du sexe

3.3. Level of satisfaction in the consumption of Garcinia kola and Cola nitida according to age group and gender

The level of satisfaction can be broken down in two ways:
• Total satisfaction with the desired effect (O)
• and dissatisfaction (N).

Thus, based on both trends, all age groups presented virtually the same results (Figure 21A). Age group A1 shows 75% of people satisfied with the desired effect versus 25% of people not satisfied (X2= 149.14; p= 0.0000; the difference is very significant in favour of satisfaction). At the level of age group A2, there is 83.05% satisfaction against 16.95% dissatisfaction (X2= 215.37; p= 0.000; the difference in satisfaction is very significant). And finally, we have 75% satisfaction versus 25% dissatisfaction for the A3 age group (X2= 36.01; p= 0.0000; the difference is very significant).

At the gender level (Figure 21B), for women, the same is true. Satisfaction outweighs dissatisfaction. Thus, we obtain 76.61% of women who are satisfied versus 23.39% who are dissatisfied with the desired effect (X2= 98.90; p= 0.0000; the difference is significant). Among men, 78.79% are satisfied versus 21.21% are dissatisfied (X2= 294.11; p= 0.0000; the difference is very significant).

Figure 5: Niveau de satisfaction de l'effets recherchés dans la consommation de *Garcinia kola* et de *Cola nitida* en fonction du sexe

4. Discussion

Our work focused on the level of consumption of Garcinia kola and Cola nitida and the effects sought in this consumption. The epidemiological survey took place from September to December 2017, on 1800 people including 513 women and 1287 men. It took place in two communes of Abidjan and in the city of Sikensi. The subjects showed almost the same behaviour everywhere.
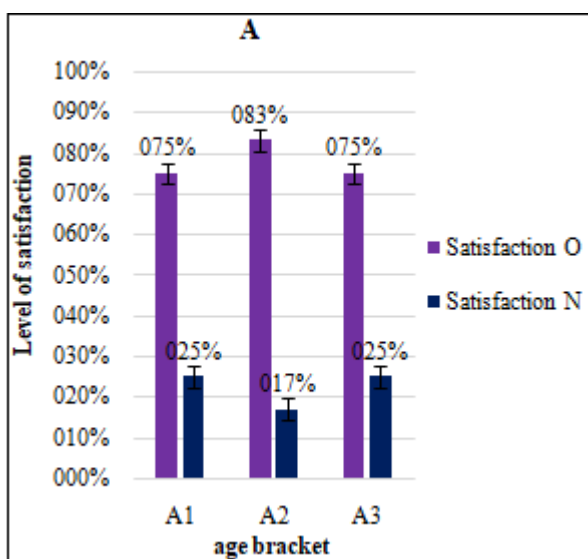

Figure 4: Niveau de satisfaction de l'effets recherchés dans la consommation de *Garcinia kola* et de *Cola nitida* en fonction de la tranche d'âge

The study of the level of consumption was our first objective since for some authors, Garcinia kola has medicinal importance [7]. When we observe the survey of all age groups surveyed, the majority consumes Cola nitida and Garcinia kola. As our results show, Garcinia kola is better appreciated by men and women compared to Cola nitida. The cause of its use is nutritional, health, cosmetic, pharmaceutical, etc... [8], [9. The most appreciated products are the seeds, commonly chewed by rural and urban populations to avoid and treat gastric problems or simply for their typical astringent taste. On the other hand, other forms of consumption such as the use of Garcinia kola bark added to palm wine are not negligible [10] because all these forms contribute to meet the needs of the consumer.

With regard to the desired effects, several people justify their consumption of Garcinia kola, through the positive results on their health that they testify. According to the results of our survey, Garcinia kola has an effect on pain with 56% of consumers and aphrodisiac with 25.17% of consumers. This corroborates the claims of some authors who have shown that Garcinia kola seeds are chewed as an aphrodisiac and used to cure cough, dysentery, chest cold, liver disorders, diarrhea, laryngitis, bronchitis and gonorrhea [11]. Also, 13.17% of people consume Garcinia kola for its effect on alertness highlighted by the studies of Dalziel (1937). Thus on all three municipalities and for each age group, pain is the main cause of consumption of Garcinia kola. Indeed, as demonstrated by some authors, the seed is used to prevent and relieve colic; it can also be used to treat headaches, stomach aches and gastritis [12]. It can also be used to treat jaundice, high fever and as a purgative [13]. The seeds are mainly used to treat abdominal pain and malaria [14].

The actions of Garcinia kola, which all these researchers testify to, on the various ills that undermine society, emanate from its chemical components. Indeed, Garcinia kola contains tannins, saponins, alkaloids, cardiac glycosides [15]. Other phytochemical compounds isolated from the seeds of G. kola are biflavonoids such as kolaflavone and 2-hydroxybi-flavonols. Two new chromanols, garcioic and garcinal, as well as tocotrienol have been reported isolated from Garcinia kola [16]. These components are very important in the maintenance of medical health and can only give satisfaction to consumers. In fact, the satisfaction found by consumers of Garcinia kola in all three municipalities, at the level of different age groups and gender is very significant. The majority of consumers are satisfied. For example, 83.05% of people in the A2 age group show that they are satisfied with the consumption of Garcinia kola. In addition to the effects on pain, Garcinia kola fights bacteria [17] - [21]; has antidiabetic, antilipidemic and anti-atherogenic properties with a huge potential for protection against coronary heart disease, heart disease [22] - [25]. Garcinia kola has been shown to have effects on fertility and to improve sperm quality and libido [26]. This satisfaction is materialized by the denomination "miracle plant" [7] granted to Garcinia kola.

5. Conclusion

This work was initiated in order to determine the level of consumption of Garcinia kola and Cola nitida by the population as well as the desired effects. Garcinia kola has enormous virtues as Cola nitida in the treatment of various biological problems expressed by the population. But there are people who prefer Garcinia kola to the detriment of Cola nitida as the different results obtained during our survey have shown us. Its regular consumption by the population can be summed up in the satisfaction of desired effects: effect on pain, fatigue and state of alertness. These are the key factors, obviously in addition to its aphrodisiac side, that lead the different age groups to consume both species. Age group A2, i.e. those between 35 and 55 years of age, consumes more Garcinia kola and the male gender consumes more than the female gender.

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