Consumption Survey of *Justicia Galeopsis* T. Anderson Ex C.B. Clarke (Acanthaceae) a Wild Food Plant in Côte d'Ivoire (West Africa)

Ahou Leticia Loukou
Koua Herve Kouakou
Adouko Edith Agbo
Kouakou Brou
Nangui Abrogoua University, Food Science and Technology Department, Abidjan 02, Côte d'Ivoire

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Abstract

The aim of this study was to evaluate the level of knowledge and consumption of *Justicia galeopsis*, a wild food plant, in Abengourou (Côte d'Ivoire). A survey of food consumption has been conducted among the populations and 100 persons have been interviewed. The data revealed that they all have already consumed *J. galeopsis* leaves. The main reasons of *J. galeopsis* leaves consumption refer to nutritional value and flavor. There were always cooking before eating and associated mainly with groundnuts (95%) or gumbo (5%). Twenty-seven percent of consumers every day eat *J. galeopsis* leaves against 64% who consume once or twice a week, 6% twice a month, 3% occasionally. 6% the populations collected these leaves in the market against 94% who obtained them from their field which is far from the village. Although the fields were far from the village, 74% of population prepares *J. galeopsis* just after the collect without conservation. The cooking time of leaves associated with peanuts or okra is estimated by 41% of the households at 30 minutes. Five percent prepared them during 45 minutes and 22% during one (1) hour. This study reveals that *J. galeopsis* is a famous plant in Abengourou. Its leaves are greatly appreciated by all populations studied.

Keywords: Consumption survey, Knowledge, *Justicia galeopsis* leaves, Nutritional values

Introduction

Spontaneous flora is present in different environments such as savannas, mangroves and especially forests, etc. It plays a very important role

in the socio-economic development of populations in developing countries as source of food, income, energy, medicine, building materials. In Côte d'Ivoire, in less than 40 years, nearly 12 million hectares of forest have disappeared under the combined effect of logging and shifting cultivation (Kouamé et al., 2008), resulting in disappearance or rarefaction of many plant species. The intense degradation of the forest thus raises the problem of the survival of uncultivated plants, commonly known as wild food plants. However, the Ivorian flora is rich and contains many wild food plants (Ambé, 2001, Kouamé and Gnahoua, 2008, Djaha and Gnahoua, 2014). The wild food plants are real sources of dietary supplements and incomes in rural areas (Kouamé et al., 2008). According to Djaha and Gnahoua (2014), these plants contribute effectively to nutrition as an *integral part* of the diet and / or asset of family food security and are the subject of flourishing trade whose main actors are women. As far as, their nutritional quality is highly appreciated by the populations (N'Dri, 2010). Indeed, these plants are valuable sources of nutrients, especially, in rural areas where they contribute substantially to the intake of proteins, minerals, vitamins, fiber and other nutrients, which are usually rare in daily diet (Mohammed and Sharif, 2011; Idoko *et al*., 2014).

Despite their importance in some local food systems, wild food plants are increasingly neglected because of new Western eating habits. Indeed, the populations, even those in rural areas today prefer manufactured food products because they are available and often cheaper. The valorization of wild food plants becomes, in these conditions, quite difficult in some region of Côte d'Ivoire. Indeed, according to the populations of this region, consuming these plants is a sign of poverty in contrary to the consumption of the manufactured products which is a sign of ease and social success (Kouakou, 2015).

Studies of the valorization of wild food plants were initiated, to inventory them through ethnobotanical surveys and then to evaluate and show the nutritional potential of some of them. So, the consumption of *Justicia galeopsis* T. Anderson ex C.B. Clarke leaves has been mentioned by Yao *et al*. (2014). For these authors, these leaves were mainly used at medicinal purpose. This plant exhibited weak antioxidant but high amount of total phenolics. It is more present in the department of Abengourou, in the East of the country. It seems endemic to this Ivorian region and remains, however, very little known in other parts of the country. The literature doesn't mention its consumption levels in Côte d'Ivoire and its nutritional value. It is therefore necessary that their levels of consumption, which are already too low, be increased.

The purpose of this study is to evaluate the level of knowledge and consumption of this plant by a survey of food consumption among the populations in the department of Abengourou.

Materials and Methods

Description of the study area

The study was carried out in the department of Abengourou, Côte d'Ivoire (Figure 1). The department of Abengourou is located in the eastern part of Côte d'Ivoire between 5°45 N and 7°10 N latitudes and 3°10 W and 3°50 W longitudes (Aka *et al*., 2013). It covers an area of 5,200 km². The department of Abengourou is limited to the West by departments of Arrah, "Akoupé", "Adzopé", to the north by the department of Agnibilékrou, to the north-West by the department of Daoukro, to the east by Ghana and to the south by the departments of "Yakassé-Attobrou" and "Bettié". The department of Abengourou belongs to the domain of the humid dense forest. The climate is subequatorial, hot and humid with a mean annual temperature of 26 °C. The annual rainfall amounts to 1200 mm (Aka, 2010). From a topographic point of view, the Abengourou region is generally composed of a relatively flat and monotonous relief with an altitude of between 100 and 280 m characteristic of southern Côte d'Ivoire (Aka *et al.*, 2013).

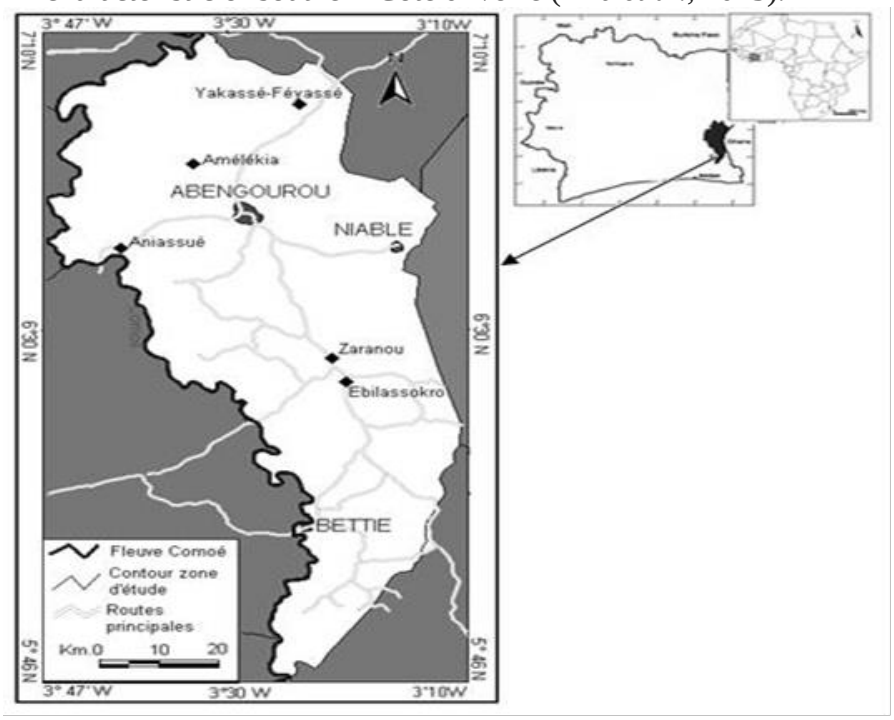

Figure 1. Location of Abengourou department
Source: Aka *et al.* (2013)

Data collection method

Field research was done during two weeks. It was conducted by collecting ethnobotanical information during structured and semi-structured interviews knowledgeable people native in 5 sub-prefectures. In each sub-

prefecture 4 villages were selected. Civil and customary authorities and local community were informed and their permissions were received before applying the questionnaire. Sample consisted of men and women randomly selected. The interviews were conducted individually either in the local language or in French with youth (18-35), adults (36-55) and old people (≥ 55). Education level (primary, secondary, university or illiterate) and ethnicity were listed during the investigation. The questions were about the knowledge and consumption levels of *Justicia galeopsis*, consumption methods, consumers' satisfaction, cooking time and conservation mode. Twenty (20) households per sub-prefecture (5 households per village) were randomly selected and interviewed by one of our field researchers for a total of 100 households equivalent to 100 persons.

Statistical Analysis

Data were collected and analyzed with IBM SPSS software version 22 for windows where data were subjected to descriptive statistics for calculation of frequencies.

Results

Characteristics of the respondents

Surveyed persons were subdivided as follow: 96 women and 4 men with 27 % of youth, 57 % of adults and 16 % of old (Figure 2). Among youth, there were 25 % of women and 2 % of men. For adults, there were 56 % women and 1 % men, compared to 15 % women and 1 % men in the elderly (Figure 3). Fifty seven (57 %) of persons had been in school against 43 % who were not. 30 % have a primary education level, 25 % have a secondary education level and 2 % have a level of university education (Figure 4). The main ethnic group was Agni (local language), it represent 97 % of respondents.

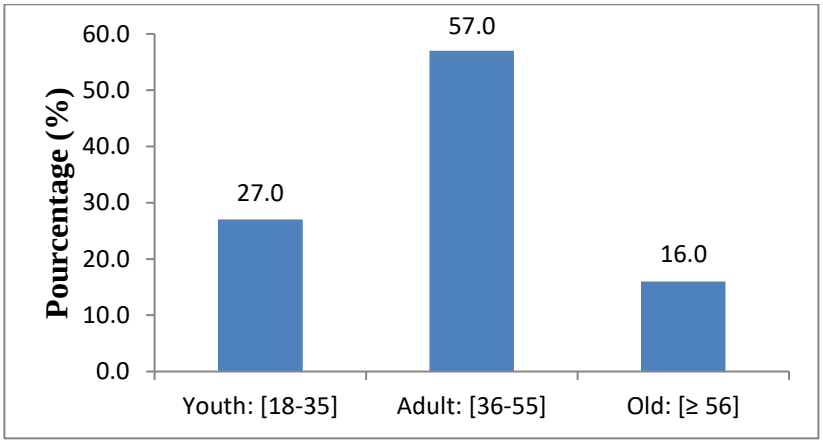

Figure 2. Population distribution by age

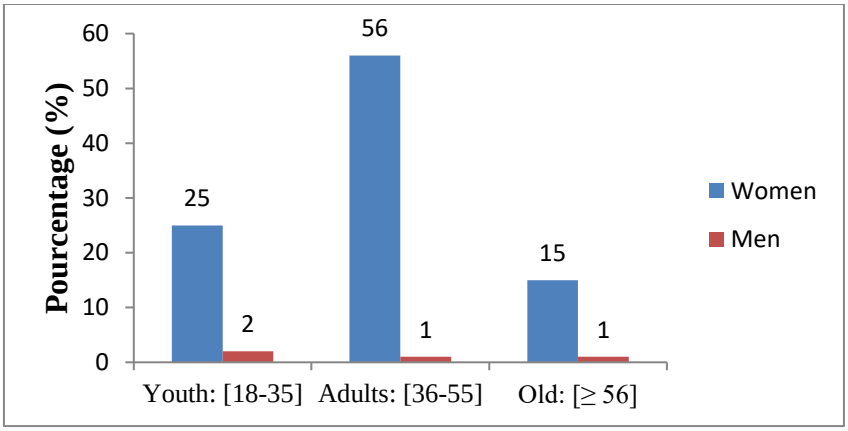

Figure 3. Population distribution by age and gender

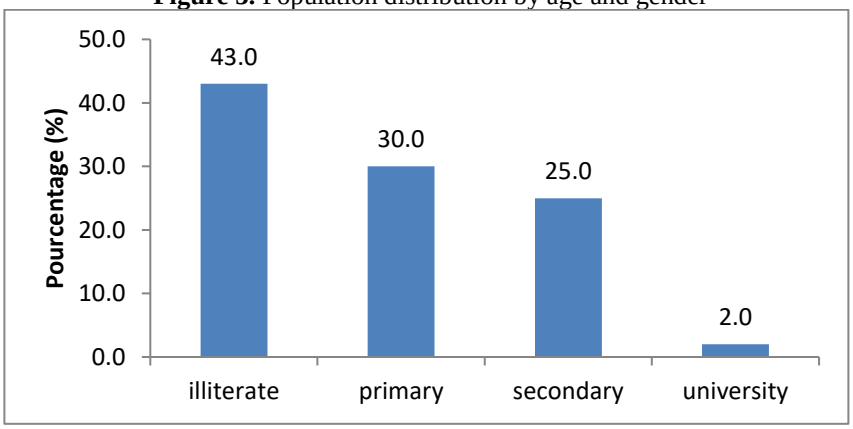

Figure 4. Population distribution by education level

Knowledge of *Justicia galeopsis*

The study revealed that people have a perfect knowledge of *Justicia galeopsis*. All the respondents (100 %) know the name of this plant in their local language (Agni) as *Assiaploua*.

Consumption of *Justicia galeopsis*

All households (100 %) consumed *Justicia galeopsis*. Figure 5 shows the sources of motivation related to the consumption of *J. galeopsis*. 64 % of individuals feel that *J. galeopsis* are nutritious while 36 % consume them for their flavors.

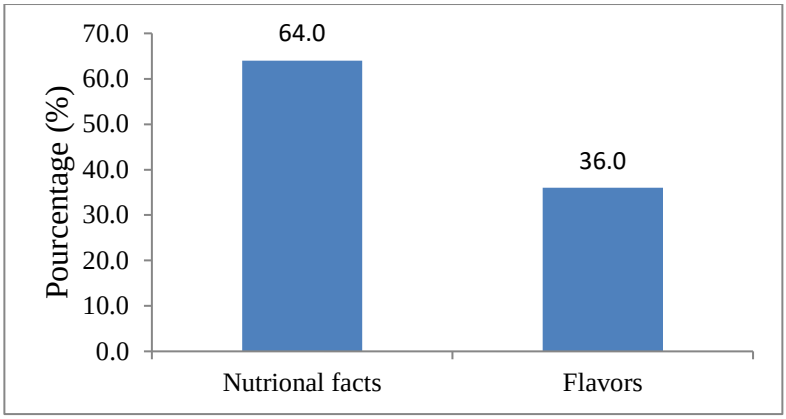

Figure 5. Sources of motivation for *Justicia galeopsis* consumption

Pattern and frequency of *Justicia galeopsis*' consumption

The results showed that the leaves of *J. galeopsis* are always cook before eating and associated with either groundnuts (95 %) or okra (5 %). Twenty-seven (27) % consume *J. galeopsis* every day and as much as possible, 64 % eat them once or twice a week, 6 % twice a month, 3 % occasionally (Figure 6). The consumption survey revealed that 94 % of the populations obtained these leaves in their field against 6% who obtained them either in the field or in the market. Among those who consumed this plant every day, 24 % have their field far from the village and 3% closer to the village. Fifty-six percent (56 %) of those who consume once or twice a week have their field far from the village, 8 % have their field near the village. Among the populations that consume the leaves once or twice a month, 5% have their field far from the village and 1% beside the village. For those who rarely consume, all have their field far from the village (Figure 7). In general, the results show that all those who consume the leaves of *J. galeopsis* have their field far from the village.

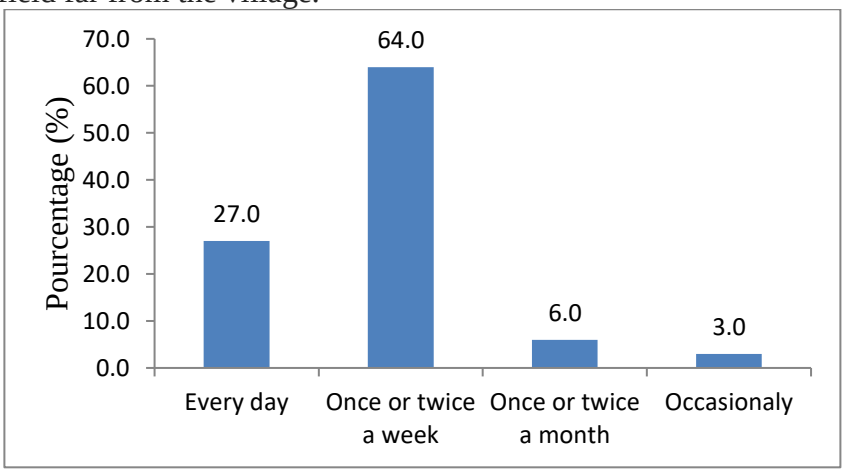

Figure 6. Frequency of *Justicia galeopsis* leaves consumption

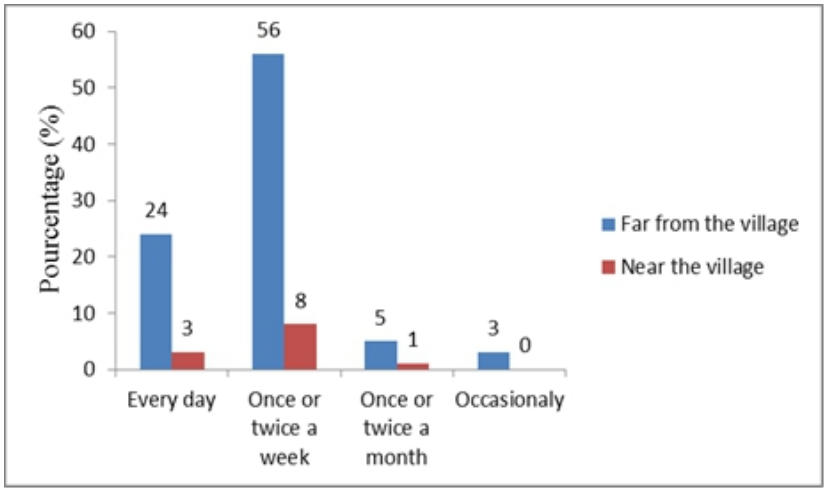

Figure 7. Frequency of consumption of the plant compared to the place of supply

Cooking time of *J. galeopsis* leaves

Thirty-two (32) percent of the surveyed households observed a pre-cooking time of 10-15 minutes for *J. galeopsis* leaves, while 68 % neglected it. The cooking times of leaves associated with peanuts or okra varied in households. 41 % of the households surveyed prepared the leaves during 30 minutes. Five (5) % prepared them during 45 minutes. Twenty-two (22) percent of households cooked them during one (1) hour (Figure 8).

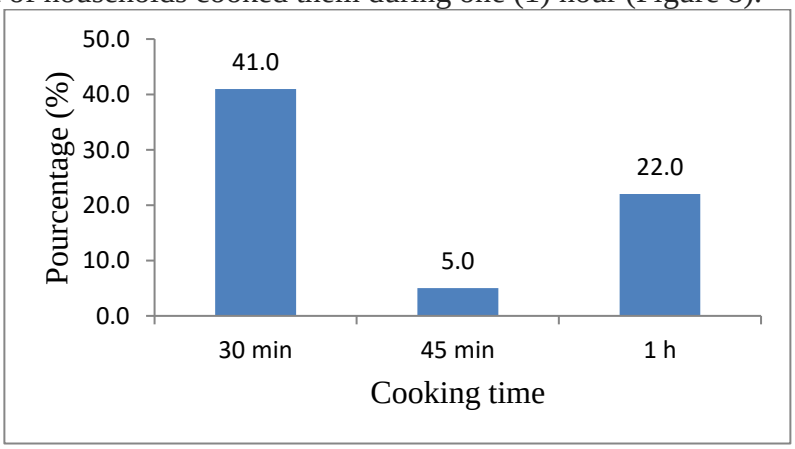

Figure 8. Cooking time of *Justicia galeopsis* leaves

Conservation mode *J. galeopsis* leaves

Figure 9 shows the conservation mode of *J. galeopsis* leaves by households. Seventy-four (74) percent of households do not store the leaves, while 26 percent conserve them. Among those who keep the leaves, 17 % keep them on the kitchen roof, 3 % in the banana leaves and 6 % in the water.

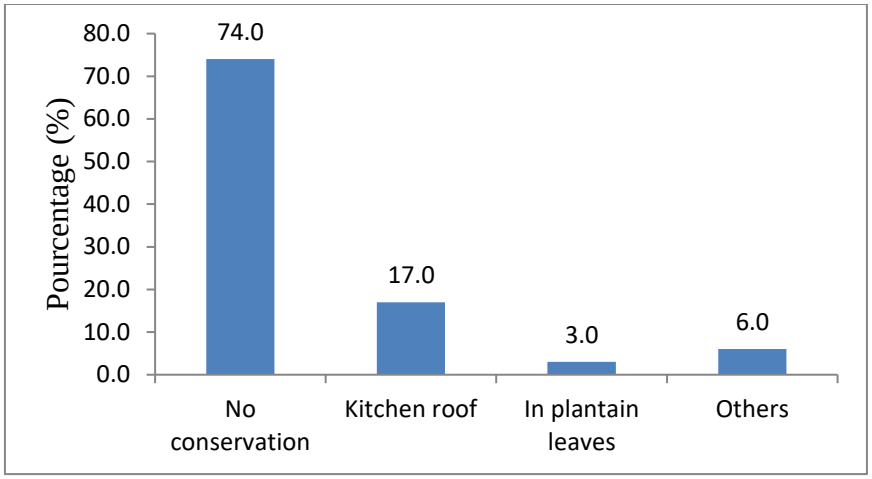

Figure 9. Conservation mode of *Justicia galeopsis* leaves

Discussion

The consumption survey showed that the respondents were in majority women and adults because they are in charge of the house, kitchen and cooking. *J. galeopsis* is well known by Abengourou department population. All respondents have consumed their leaves once in their life. 64 % of them feel that *J. galeopsis* are nutritious while 36 % consume them for their flavors. The fact that the respondents consumed *J. galeopsis* for their nutritious value and their flavors suggest that they are conscious that the plant has some nutrients which are benefic for human being and which can also have health effects. However, population could consume a plant for other reasons. For example, according to Itoua *et al*. (2015), 76 % of consumers of *Phytolacca dodecandra* L'Herit leaves (a wild food plant leave) prefer them for their taste.

Justicia galeopsis is a ***seasonal plant. It is*** abundant during the rainy season but all surveyed people consume them regularly. This percentage is higher than those obtained by Itoua *et al*. (2015) for the consumption of *P. dodecandra* leaves (86 %). Populations consuming once or twice times a week are the most numerous. That means that although *J. galeopsis* is seasonal plant, some women make them available throughout the year by planting a few feet in their field which are far from the village. So, the leaves of this plant are very appreciated by the majority of the populations who, in addition to consuming them daily, consume them on feast days and offer them to their distinguished guests. They are always cooking before eating, most time associated with groundnuts (95 %) rarely with gumbo (5 %). According to the population, *J. galeopsis* leaves can be eaten alone but their association with groundnut or gumbo improves the flavor of the sauce.

These leaves are cooked in two stages according to the populations surveyed. These stages are the pre-cooking and the final cooking of the leaves

associated with fish, meat or snail. Most households ignore the pre-cooking time of the leaves. However, 32 % estimate it at 10 to 15 minutes. This cooking time is low compared to this of amaranth leaves which is estimated at 20 minutes according the works of Agbo (2006). According to Oluoch *et al*. (2009), the best practices for vegetable preparation methods that preserve micronutrients should involve the short cooking times. The cooking time of leaves associated with groundnut or gumbo varied among households. This difference in cooking time is due to the cooking method, the appearance and the texture sought by each cooker.

This study has also shown that populations, most often, do not preserve the leaves of *J. galeopsis*. Indeed, the women buy or gather in their field the quantities of leaves they need for the repast of the day. However, 17 % of people keep them on the roof of the kitchen and 3 % in the plantain leaves. Those who keep them are usually tradeswomen. The ambient humidity on the roofs of houses would keep the leaves fresh until the next day. But, the shelf life would not exceed two or three days. Like *J. galeopsis* leaves, Jute mallow (*Corchorus olitorius*) leaves are harvested a day before or the same day of the sale but there is no special preservation method in Côte d'Ivoire for them (N'Gbesso *et al*., 2009). Indeed, leaves harvested the day prior to sales are stocked in open air in heaps that are sprinkled with water to preserve leaf freshness.

Conclusion

This study has highlighted the trends in knowledge and consumption of *J. galeopsis* leaves in Abengourou, a region of Côte d'Ivoire. This plant is famous in this region. Most are known it in local language (*Agni*). All individuals interviewed have already consumed their leaves despite seasonal availability of the plant and the fact that it grown far from the village. They do not store the leaves, because they cook them just after the collect. *J. galeopsis* are always cook before eating and associated mostly with groundnuts and rarely with okra. The majority of population neglected le pre-cooking time of leaves. They estimate the cooking time at 30 minutes. *J. galeopsis* leaves could significantly contribute to the fight against food insecurity and poverty.

Acknowledgments

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