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Ethnobotanical investigation of some insecticidal plants used on cereals grown in the Labe Region

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Abstract

The aim of this work was to identify and investigate insecticidal plants used by communities in the Labé administrative region to protect against insect pests. The aim was to obtain alternative products, based on natural resources, to limit the damage caused by commonly used chemical products. This ethnobotanical cross-sectional study was carried out in the five prefectures of the Labé region, between April and May 2023, in order to identify the plants with insecticidal properties used by communities in this region. The methodology consisted of direct, semi-structured interviews based on a survey form. At the end of the survey, we contacted 200 informants, including 50 women. This enabled us to identify thirty-five (35) plants belonging to twenty-one (21) families. 25% of these informants were in the 40-45 age bracket, followed by 20% in the 55-65 age bracket. These results show that people in the Labé region have traditional knowledge and know-how about plants with insecticidal properties. The inheritance mode of knowledge (75%) and the apprenticeship mode of knowledge (42%) would justify this judgement. The identification, phytochemical analysis and verification of the toxicity of other plants from the region concerned will be the subject of future studies.

Keywords: Insecticide plant; Flora; Heritage; Insect pests; Cereals

1. Introduction

The agricultural sector is one of the main activities contributing to a country's socio-economic development. Agriculture employs over 40% of the world's population, including more than 52% in Africa and Asia [1;2;3;4].

According to statistics from the World Health Organization (WHO), around 200,000 people die every year. And while Africa uses only 2% to 4% of the world's synthetic pesticides, it remains the continent most exposed to the risk of mortality associated with poor knowledge of synthetic pesticide use [5;6;7;8;9;10]. The excessive use of insecticides to eradicate pests is increasing daily. Cereal grain losses vary from 10 to 20% due to insect damage to stored grain. Some 2.5 million tonnes of pesticides are used to limit pest damage [11].

In the Republic of Guinea, insect pests destroy 30% of cereal production [12]. To solve this major problem, new insecticide molecules derived from local plants have been tested and clarified. Most crops are susceptible to attack by insect pests, which are the main cause of yield losses [13]. However, many plant-derived substances have no or very

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low phytotoxicity, indicating their potential for direct use against insect pests and diseases [14]. One of the relationships between society and its ecosystem is the tradition of using plants as medicines or insecticides. Traditional knowledge about the use of plants as insecticides is based on the experience of previous generations, and goes back to the origins of society and humanity. Plants influence every aspect of human existence. The ethnobotanical study of insecticidal plants aims to identify and report on the knowledge and potential of crop insecticidal plant resources, as well as efforts to preserve and develop them in the future [15]. Knowledge of insecticidal plants is transmitted orally from generation to generation [16].

The general aim of this study is to list plants with insecticidal properties, but also to find out about all the people who have knowledge of the use of plants as insecticides in the Labé administrative region. Then, to obtain effective, ecological and sustainable treatment methods against insect pests in maize, rice and fonio fields and warehouses in the administrative region of Labé in the Republic of Guinea

2. Material and methods

2.1. Presentation of the study area

The Labé region is one of the 8 administrative regions of Guinea, located in the center-north of the country. It covers an area of 2,286,900 ha (22,869 km^2), has a population of 1,097,633 (2017) and a density of 48 inhabitants/km^2. Its geographical coordinates are 11° 45' north, 12° 00'west. It is bordered to the north by Senegal and Mali, to the east by the Faranah administrative region, to the west by the Boké administrative region and the Mamou and Kindia administrative regions.

The Labé region is divided into five prefectures, which are subdivided into 53 sub-prefectures: Koubia prefecture (6 sub-prefectures), Labé prefecture (13 sub-prefectures), Lélouma prefecture (11 sub-prefectures), Mali prefecture (13 sub-prefectures), Tougué prefecture (10 sub-prefectures).

The Labé region is crossed by the north-west line of equal latitude and longitude [17].

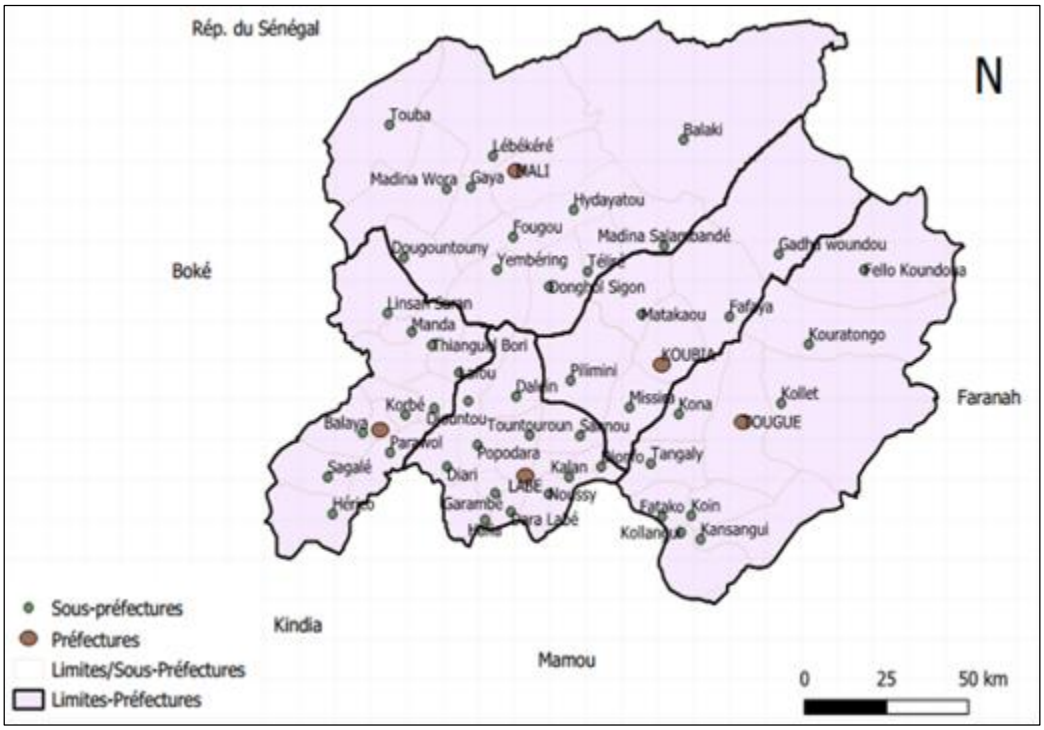

Figure 1 Map of the Labé region

2.2. Field materials

- Plastic bags ; - Markers ; - Glue ; - Pen ; - Blade ;
- Scissors; - Android phone; - Paper folder.

2.3. Ethnobotanical survey

This is a descriptive cross-sectional survey conducted between April and May 2023 in the Labé region. The aim was to gather information on the use of plants with insecticidal properties. We met key informants such as traditional healers, farmers and the elderly. Ethnobotanical information was collected through individual interviews based on open, direct questions in vernacular languages, using a specially designed survey form. Field observations were then carried out with the communities as a guide to compile the herbarium for each plant.

3. Results and discussion

3.1. Insecticide plant species

Following these surveys, we identified 35 insecticide plant species belonging to 21 families used by farmers in the region for treatment. The insecticidal plant species found by the Peulh community showed that communities in the Labé region had a great deal of knowledge of the use of insecticidal plants. Following this survey, we listed the plants in terms of frequency of use. The plant species used as insecticide plants by the community in the administrative region of Labé can be seen in Table 1.

Table 1 Scientific names of plants

[N°	**Name Vernacular Of Plants (Poular)**	**Name Vernacular Of Plants (Poular)**	**Frequency Of Quote**	**The Organs Cited**	**Manufacturing Process**	**Scientific Name**	**Botanical Family**
1	Dioutou	Dioutou	28	Whole plant	Fumigation	*Securidaca longpedunculata Fres.*	Polygalaceae
2	Loubhi-loubhi	Loubhi-loubhi	20	whole plant	Fumigation	*Hyptis suaveolens A. L.Poit. 1806*	Lamiaceae
3	Teli	Teli	18	Stem bark	Fumigation	*Erythrophleum suaveolens G. Don.*	Fabaceae
4	Warnanna	Warnanna	17	The leaves	Fumigation	*Ficus natalensis Miq.*	Moraceae
5	Gnari sèckè	Gnari sèckè	15	The leaves	Fumigation	*Asparagus africanus*	Asparagaceae
6	Kahi	Kahi	14	Ecorse de tige	Fumigation	*Khaya senegalensis A. Juss.*	Meliaceae
7	Nètè	Nètè	13	The fruits	Fumigation	*Parkia biglobosa Benth.*	Fabaceae
8	Bantara bourourè	Bantara bourourè	13	The leaves	Fumigation	*Vernonia colorata Dracke*	Asteraceae
9	Kaba	Kaba	12	The roundup	Fumigation	*Zea mays L. 1753*	Poaceae
10	Bounmè	Bounmè	11	The leaves	Fumigation	*Vitex madiensis Sweet*	Verbenaceae
11	Gnamakou	Gnamakou	11	The fruits	Fumigation	*Capsicum frutescens L. 1753 Raphia*	Solanaceae
12	Modia Thialèl	Modia Thialèl	10	The leaves	Fumigation	*sudanica A.Chev.*	Arecaceae
13	Boulè Babbi	Boulè Babbi	10	The leaves	Fumigation	*Acanthospermum hispidum,D.C. 1836 not A.Chev. 1920*	Asteraceae

14	Kassia Thièwkal	Kassia Thièwkal	10	The leaves	Fumigation	*Azadirachta indica A. Juss. 1830*	Meliaceae
15	Hako Yilmerè	Hako Yilmerè	10		Fumigation	*Icacina senegalensis Miers 1851*	Icacinaceae
16	Sindia	Sindia	1	The leaves	Fumigation	*Cassia Sieberiana L.1753*	Caesalpiniceae
17	Booto	Booto	9	Leaves and fruits	Fumigation	*Detarium Senegalense J.F.Gmel.1791*	Caesalpiniaceae
18	Kidi Gorè	Kidi Gorè	1	The leaves	Fumigation	*Jatroph Lucas L.1753*	Euphorbiaceae
19	Popo	Popo	1	The leaves	Fumigation	*Mitragyna Stipuloso DC. Kuntze*	Rubiaceae
20	Soukouran Naye	Soukouran Naye	1	The leaves	Fumigation	*Ocimum Cratinimum L.1753*	Lamiaceae
21	Gowè	Gowè	1	Whole plant	Fumigation	*Cyperus Articulatus L.1753*	Cyperceae
22	Pouki	Pouki	4	The leaves	Fumigation	*Pennisetum Hordoides Pers.1805*	Poaceae
23	Barkè	Barkè	4	The leaves	Fumigation	*Piliostigma Thonningii Hochst., 1846*	Caesalpiniceae
24	Maro naye	Maro naye	1		Fumigation	*Allizia Adianthifolia (Schumach.) W.Wight, 1909*	Mimosaceae
25	Garkassaki	Garkassaki	1	The leaves	Fumigation	*Alchornea Cordifolia (Schumach. & Thonn.) Müll.Arg., 18651*	Euphorbiaceae
26	Bami	Bami	2	The leaves	Fumigation	*Hibiscus sterculiifolius (Guill.&P ERR)*	Malvaceae
27	Boulè babbi	Boulè babbi	1	The leaves	Fumigation	*Acanthospermum Hispidum D.C. 1836 not A.Chev. 1920*	Asteraceae
28	Lakka	Lakka	1	Whole plant	Fumigation	*Canthium venosum Lam.*	Ribiaceae
29	Kathiou	Kathiou	2	The fruits	Fumigation	*Citrus lemon (L.) Osbeck*	Rutaceae
30	Simmé	Simmé	5	The leaves	Fumigation	*Milicia regia (A.Chev.) C.C.Berg*	Moraceae
31	Gogo	Gogo	1	Whole plant	Fumigation	*Aframomum sulcatum (Oliv. & D.Hanb. ex Baker) K.Schum.*	Zingiberaceae
32	Keri	Keri	4	Stem bark	Fumigation	*Antidesma venosum L. 1753 not Wall.1832*	Euphorbiaceae
33	Boïlè	Boïlè	2	The leaves	Fumigation	*Artabatrys velutinus R.Br*	Annanaceae
34	Gobi	Gobi	7	The fruits	Fumigation	*Carapa procera DC.,1824*	Meliaceae
35	Thielen	Thielen	5	Stem bark	Fumigation	*Cassia occidentalis L., 1753*	Caelpiniceae

3.2. Sociodemographic characterization of respondents

The global ethnobotanical studies carried out in the 5 prefectures of the Labé region have shown that medicinal and insecticidal plants play a significant role in the field of medicine, and insecticides only in food and cosmetic applications. From the information gathered in the different zones, we found that the use of insecticide plants to store cereal crops has almost disappeared. Farmers use phytosanitary products from start to harvest, and even for grain storage. On the results obtained by the 200 informants made up of farmers, healers, marabouts and elders from the various villages questioned on the basis of the survey form. Of the 200 informants, we recorded 150 men, most of whom were aged between 45 and 60, with the remainder in the 60 to 90 age bracket. Among these informants, we counted 50 healers, only 20 of whom had studied abroad (Niger, Nigeria, Senegal, Burkina Fasso and Mali), the other 30 having inherited their knowledge from their parents and grandparents. The 50 women who provided information ranged in age from 50 to 80, and most of them learned about the use of plants as insecticides from their parents and grandparents. All the literature is represented in the tables below.

Table 2 Distribution of respondents by gender

N°	Gender	Number	Percentage
1	Male	150	75%
2	Female	50	25%
Total			100%

This table shows that 75% of the informants were male.

Table 3 Distribution of respondents by age group

N°	Age range	Number	Percentage
1	≤ 40	10	5%
2	[40-45]	50	25%
3	[45-55]	30	15%
4	[55-65]	40	20%
5	[65-70]	30	15%
6	[70-80]	15	7,5%
7	[80-85]	15	7,5%
8	[85-90]	10	5%
Total		200	100%

The data in this table show that the [40-45] age group is the most represented (25%), followed by the [55-65] age group (20%). The least represented age brackets are: ≤ 40 and] 85- 90] (5%).

Table 4 Distribution of respondents according to how they acquire knowledge

N°	How knowledge is acquired	Number	Percentage
1	Learning	20	10%
2	Professional experience	25	12,5%
3	Parental (inheritance)	150	75%
4	Dream	5	2,5%
Total		200	100%

The most common method of acquiring knowledge is by inheritance (75%). This is followed by professional experience (12.5%) and apprenticeship (10%). The mode of acquiring knowledge by dreaming (2.5%) is the least represented.

Table 5 Distribution of respondents by socio-professional category

N°	Profession	Number	Percentage
1	Marabout	16	8%
2	Feticheur	12	6%
3	Cultivator	85	42%
4	Other	17	8,5%

Among socio-professional categories, farmers are the most represented (42%).

4. Discussions

All plant organs (leaves, bark, fruit and whole plants) were cited by informants. Leaves were the most commonly used with 54%, followed by the whole plant, fruits with 14.28% and the stem bark part which occupied 11.42%. Our results are in line with those of [18;19], who reported in their studies that leaves were the most commonly used parts of the plant. These plant species are grouped into thirty-five (35) genera and belong to twenty-one (21) families (Table1).

The most representative families are Caelpiniceae (19.04%), Meliaceae (19.04%), Euphorbiaceae (14.28%), Lamiaceae (14.28%) and Fabaceae (9.52%). The results of the ethnobotanical survey show that the plant species most commonly used to combat insect pests in the Labé region are : Securidaca longpedunculata (13.20%), Hyptis suaveolens (9%), Erythrophleum suaveolens (8.49%) and Ficus natalensis (8.01%), Asparagus africanus (7.07%) and Khaya senegalensis (6.06%) (Table 1). The method of use was 100% fumigation.

These results corroborate those of [20]. who, in their study, highlighted the use of synthetic pesticides for effective insect pest control. These results are also in line with those of the present study.

The results of the ethnobotanical survey show a predominance of men among respondents in the Labé region. Of the 200 respondents, 150 were men and only 50 were women (Table 2). In the present study, the language of communication was Pular. This suggests that the farming profession is still very much alive in the Labé region, and mainly in this community, where farmers account for 42% of the workforce, followed by the other trades with 8.5% (table V). We also noted that the average age of the respondents we met was around forty-eight (48), the youngest being 40 and the oldest 90 (table 3). In terms of mode of knowledge acquisition, we noted a predominance of inheritance (75%), professional experience (12.5%) and apprenticeship (only 10%) (Table 4). Our results are in line with those of [21], who reported in their studies on the basis on which respondents acquired their knowledge of the use of plants as insecticides. This could justify the respondents' extensive experience in the traditional use of plants as insecticides in the Labé region.

To remedy the problems resulting from the use of synthetic pesticides, pesticidal plants offer a promising alternative in the West African context. Indeed, scientific literature shows that many plants in the West African flora have enormous biocidal potential against a wide range of bio-aggressors [22].

5. Conclusion

Ethnobotanical surveys carried out in the five (5) prefectures of the Labé region enabled key informants to identify 35 plants with insecticidal properties belonging to 21 families. Leaves are more widely used than other plant organs. The importance of valorizing traditional plant resources highlights the scope for ethnobotanical studies. This study teaches us that the relationship between people and plants bears witness to the history of each country. According to our informants, the low use of plants as insecticides can be explained by the abundance of chemical products on the market, which has harmful consequences on the health of the population. The identification, phytochemical analysis and verification of the toxicity of certain plants in the region concerned will be the subject of our forthcoming studies.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflicts of interest.

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