

**ETHNO APICULTURAL SURVEY OF MELLIFEROUS PLANTS SPECIES IN THE
TAMBACOUNDA DISTRICT, SENEGAL**

ABSTRACT

An ethno-apicultural survey was carried out for the plant species pollinated by honey bees in the Tambacounda District (East Senegal). This survey was conducted among 85 actors with a well-established questionnaire concerning beekeepers in this District. The listed melliferous flora was made of forty five species either. It's divided in forty one genera and seventeen families though the most represented are in decreasing order Fabaceae with 12 species (26.66%) followed by Combretaceae and Malvaceae with 6 species (13.33% each), Gramineae with 3 species (6.66% each), then Anacardiaceae, Lamiaceae, Meliaceae and Rubiaceae with 2 species (4.44% each) and then Apocynaceae, Moringaceae, Musaceae, Sapindaceae, Balanitaceae, Myrtaceae, Nymphaeaceae, Rhamnaceae, Rutaceae with 1 species (2.22% each). The most cited species such as melliferous plants are : *Pterocarpus erinaceus*, *Anacardium occidentale*, *Adansonia digitata*, *Azadirachta indica*, *Mangifera indica* and *Musa sapientum*. The trees are more large with 40% followed by shrubs with 33.33%, herbs which represent 24.44% and then Lianas 2.22%. Melliferous plants include 42.22% nectariferous and nectariferous polliniferous plants followed with 13.33% polliniferous and finally meliferous species with 2.22%. This study enabled us to identify six (06) species with high melliferous value. To valorize these plants and thus preserve them against abusive cuts, it is important to carry out a policy by bringing together the actors of the beekeeping industry for a better knowledge of these meliferous plants.

Key words: ethno-apicultural survey, meliferous flora, Tambacounda, Senegal

1. INTRODUCTION

The honey plants are plant species, whose the bee extract substances, such as pollen, nectar, honeydew and resin for food and make its various products (honey, royal jelly, propolis, cere ...). It is well known that the products of the hive reflect in quantity and quality the nature of the pollinated plants [12].

Melliferous plants present a vital role in ecosystem dynamics through pollinating insects. By pollinating flowers to collect pollen and nectar, bees, like other pollinating insects, pollinate and allow fertilization and reproduction of more than 80% of plant species. And as these plants are often useful or even necessary for the existence of a whole procession of other animal species, it is easy to understand that pollinating species play a major role in terms of preserving life and its diversity on our planet [11].

The District of Tambacounda has 50 local authorities including 46 communes, 4 departments. It is the most peripheral region of the country. It shares 325 km of border with Mali in the East, 62 km with Mauritania in the Northeast and 162 km with Gambia in the West. The region is bounded in the North by the Islamic Republic of Mauritania and the Districts of

Louga, and Matam, in the South by the region of Kedougou, in the East by the Republic of Mali, in the West by the Republic of Gambia and the Districts of Kolda and Kaffrine [4]. The vegetation includes several types of formations, the main ones are: the steppe, the Savannah, the clear forest, the gallery forest, the marshy meadows. The flora is very important with that of Casamance, the most diverse of Senegal. A very dense herbaceous carpet, visible everywhere, complements the rich vegetation of the region [4]. In this context, the choice must be made taking into account species with socio-economic value, species of ecological importance and species resilient to climatic and ecological conditions.

On this basis, melliferous plants are thus of unprecedented interest. It would be important to know the part of these melliferous plants in this zone hence the interest of this study. A survey will be carried out in connection with the beekeeping situation and the plants bitumized by the bees.

The aim of this study is to determine the potentially honey plants to allow good conservation of these resources, produce a reference palynothecus and a high quality beekeeping can solve the problem of malnutrition in indigenous peoples.

2. MATERIALS AND METHODS

2.1. Study Area

The survey was conducted in four communes in the District Tambacounda. The Tambacounda District has an area of 42706 km², lies at 13 ° 46' 14" N Latitude and 13 ° 40' 02" W Longitude with a population of 730473 inhabitants. Its climate is characterized by the alternation of two seasons: a dry season of 8 months and a rainy season of 4 months. The average temperature hovers around 28.6 ° C and fluctuates between a maximum average of 40.6 ° C in April and a minimum of 31.3 ° C in August, and a total annual rainfall of 800 mm / year [4].

Below representative map of the survey area (Fig 1).

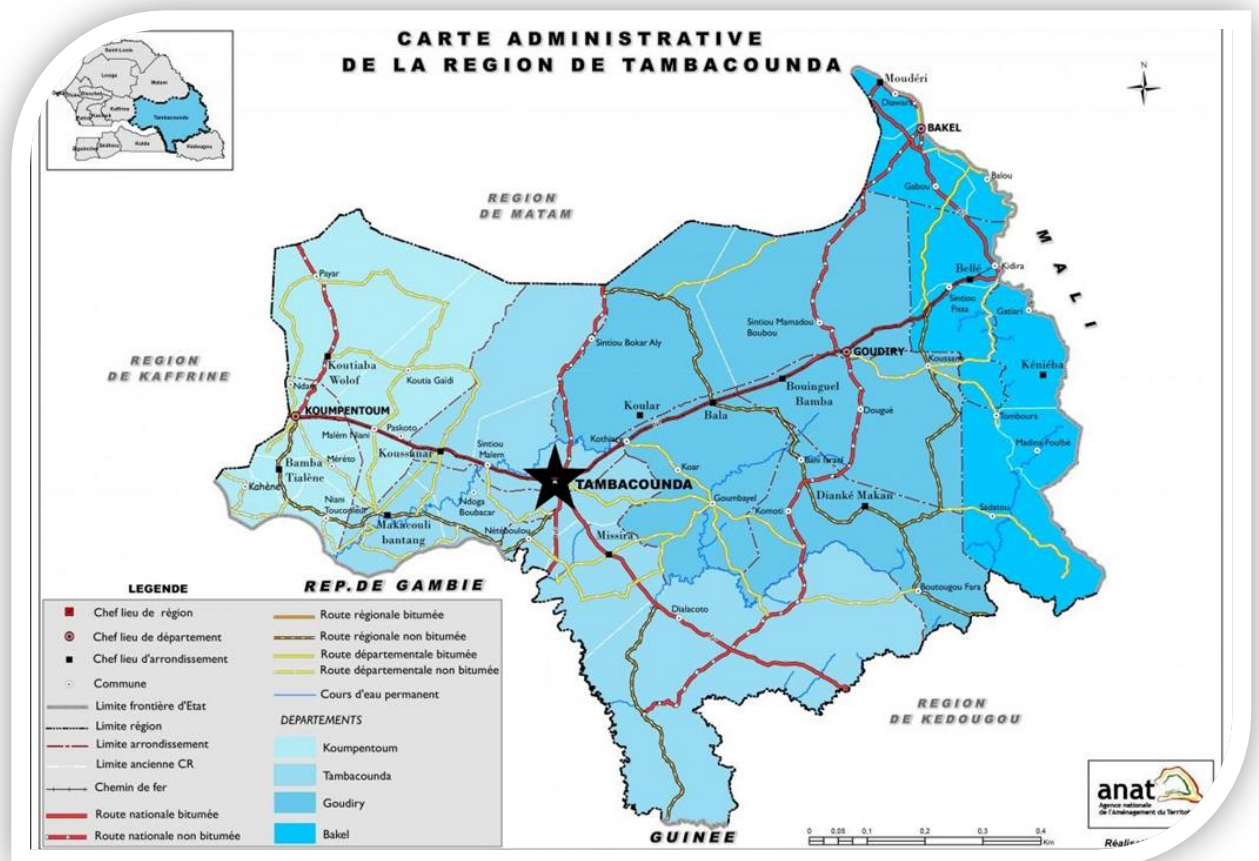


Figure 1 : Map of the survey area (ANAT, 2018)

2.2 Vegetation Description

The Tambacounda District has a Sahelian climate. The vegetation includes several types of formations, the main ones are: the steppe, the Savannah, the clear forest, the gallery forest, the marshy meadows. The flora is very important with that of Casamance, the most diverse of Senegal. A very dense herbaceous carpet, visible everywhere, complements the rich vegetation of the region [4]. The Tambacounda District is watered by a very important hydrographic network constituted by the Senegal River, Falémé, the Gambia River as well as several affluents and marigots which drain each year about 30 billion m³ of water

2.3 Socio- economic Conditions

The Tambacounda region is essentially made up of young people. The fields of activity the most providers of jobs are the Trade, the tourism, the breeding, the agriculture ...The main economic activities are agriculture, Trade and breeding. It has strong economic potential for its emergence. In 2015, the unemployment rate in the Tambacounda region (9.7%) is below the national average (15.7%) [4]. However, the problems linked to a strong exodus of populations from neighboring countries such as Mali and Mauritania can slow down this economic growth. Insecurity problems are often noted in gold zones, increasing the crime threshold.

2.4 Study Design

This study was conducted using a pre-established questionnaire. It covered the period from April 2017 to September 2017. The majority of tribe ethnic encountered were Pulaar (46.4%), Mandigo (17.4%) and Soninke (11.2%).

2.5 Collection, Identification and Classification

The unknown species of our interviews had been collected and identified in the laboratory of Botany of Cheikh Anta Diop University by Pr Diatta (Botany). The classification was made using the books of the new classification, Eklun-Natey and Kerharho, [7] ; [14] and [18]

2.6 Statistical Analysis

The database software, SPSS version 3 was used for data linkage and processing. Regular statistics (percentage) were displayed for the frequency of plants quoted. We have used as quantitative analysis such as Use- Value (UV).

3. RESULTS AND DISCUSSION

A total of 45 plant species from 41 genera and 17 families were identified as melliferous plant species. The families, botanical names, local names, nectariferous plants, nectariferous-polliniferous plants, polliniferous plants, melliferous plants, biological type, Apicol value, quote number and Frequencies are given in Table 1. The information enabled us to complete this table to share field information come from work [2] ; [8] ; [10] ; [24] ; [26] and [27].

Table 1: Plants to data cited as melliferous

| Families/botanical name of plants | Local name | Apiarian Value | Biological Type | Quote number | Frequencies |
|--|--|---------------------------------|-----------------|--------------|-------------|
| <i>Anacardium occidentale</i> L. (Anacardiaceae) | <i>Anacardier</i> (fr) <i>darkassé</i> (w) | Nectariferous | Tree | 5 | 11,11 |
| <i>Mangifera indica</i> L. (Anacardiaceae) | <i>Manguier</i> (fr) <i>mangoo</i> (w) | Nectariferous | Tree | 7 | 15,55 |
| <i>Saba senegalensis</i> (A. DC.) Pichon (Apocynaceae) | <i>Saba senegal</i> (fr) <i>maad</i> (w) | Nectariferous- Polliniferous | Liana | 3 | 6,66 |
| <i>Balanites aegyptiaca</i> (L.) Del. (Balanitaceae) | <i>Dattier du desert</i> (fr) <i>sump</i> (w) | Nectariferous | Tree | 3 | 6,66 |
| <i>Bombax costatum</i> L. (Malvaceae) | <i>Indetermined</i> | Nectariferous- Polliniferous | Tree | 1 | 2,22 |
| <i>Ceiba pentandra</i> L. <i>Garetn</i> (Malvaceae) | <i>Fromager</i> (fr) <i>benténié</i> (w) | Nectariferous- Polliniferous | Tree | 1 | 2,22 |
| <i>Anogeissus leiocarpus</i> (DC.) Guill. & Perr. (Combretaceae) | <i>Bouleau d'Afrique</i> (fr) <i>ngediane</i> (w) | Nectariferous- Polliniferous | Shurbs | 2 | 4,44 |
| <i>Combretum micranthum</i> G. Don (Combretaceae) | <i>Kinkeliba</i> (fr,w) | Nectariferous- Polliniferous | Shurbs | 5 | 11,11 |

| | | | | | |
|--|--|-----------------------------|--------|---|------|
| <i>Combretum glutinosum</i> Perr. Ex DC. (Combretaceae) | <i>Chigomier</i> (fr) ratt (w) | Nectariferous-Polliniferous | Shurbs | 3 | 6,66 |
| <i>Guiera senegalensis</i> J.F. Gmel. (Combretaceae) | <i>Guiera du Sénégal</i> (fr) nguer (w) | Nectariferous-Polliniferous | Shurbs | 3 | 6,66 |
| <i>Terminalia avicennioides</i> Guill. & Perr. (Combretaceae) | <i>Badamier duvetoux</i> (fr) wolokoyo (w) | Nectariferous-Polliniferous | Tree | 1 | 2,22 |
| <i>Terminalia macroptera</i> Guill. & Perr. (Combretaceae) | <i>Badamier du Sénégal</i> (fr) wolo (w) | Nectariferous-Polliniferous | Tree | 2 | 4,44 |
| <i>Acacia dudgeoni</i> Craib Ex Hall. (Fabaceae) | <i>Acacia</i> (fr) kabétumbé (w) | Nectariferous | Shurbs | 1 | 2,22 |
| <i>Acacia macrostachya</i> Rchb. ex DC. (Fabaceae) | <i>Acacia macrostachya</i> (fr) sana (w) | Nectariferous | Shurbs | 1 | 2,22 |
| <i>Arachis Hypogaea</i> L. (Fabaceae) | <i>Arachide</i> (fr) guerté (w) | Nectariferous | Herb | 9 | 20 |
| <i>Cassia sieberiana</i> DC. (Fabaceae) | <i>Sindia</i> (fr) senjen (w) | Polliniferous | Tree | 1 | 2,22 |
| <i>Cordyla pinnata</i> | <i>Poirier du cayor</i> (fr) | Nectariferous | Tree | 2 | 4,44 |

| | | | | | |
|--|--|---------------------------------|--------|---|-------|
| <i>(Lepr. ex A. Rich.) Milne-Redhead (Fabaceae)</i> | <i>ndimb (w)</i> | | | | |
| <i>Cynometra vogelii Hook.F.(Fabaceae)</i> | <i>Cynometra (fr)</i> | Melliferous | Tree | 1 | 2,22 |
| <i>Delonix regia Boj. Maf.(Fabaceae)</i> | <i>Flamboyant (fr)</i> | Nectariferous | Tree | 1 | 2,22 |
| <i>Dichrostachys cinerea (L.) Wight & Arn. (Fabaceae)</i> | <i>Mimosa clochette (fr) sinke (w)</i> | Nectariferous- Polliniferous | Shurbs | 1 | 2,22 |
| <i>Mimosa pigra L. (Fabaceae)</i> | <i>Manzelle marie (fr)</i> | Nectariferous- Polliniferous | Herb | 1 | 2,22 |
| <i>Prosopis africana (Guill. & Perr.) Taub. (Fabaceae)</i> | <i>Prosopis (fr) kake (w)</i> | Nectariferous- Polliniferous | Tree | 3 | 6,66 |
| <i>Pterocarpus erinaceus Poir. (Fabaceae)</i> | <i>Palissandre (fr) wéne (w)</i> | Nectariferous | Tree | 8 | 17,77 |
| <i>Tamarindus indica L. (Fabaceae)</i> | <i>Tamarinier (fr) daxaar (w)</i> | Nectariferous | Tree | 2 | 4,44 |
| <i>Pinnesetum glaucum L. (Gramineae)</i> | <i>Mil (fr) dougoub (w)</i> | Polliniferous | Herb | 4 | 8,88 |
| <i>Sorghum bicolor L.</i> | <i>Sorgho (fr) tin</i> | Polliniferous | Herb | 2 | 4,44 |

| | | | | | | |
|---|---|-------------|---------------------------------|--------|---|-------|
| (Gramineae) | (w) | | | | | |
| <i>Zea mays</i> L. (Gramineae) | <i>Mais</i> (fr) (w) | <i>mbok</i> | Polliniferous | Herb | 3 | 6,66 |
| <i>Hyptis suaveolens</i> Poit. (Lamiaceae) | <i>Sanké baila</i> (d) | | Nectariferous- Polliniferous | Herb | 2 | 4,44 |
| <i>Ocimum basilicum</i> L. (Lamiaceae) | <i>Basilic</i> (fr) <i>ngungun</i> (w) | | Nectariferous | Herb | 1 | 2,22 |
| <i>Adansonia digitata</i> L. (Malvaceae) | <i>Baobab</i> (fr) (w) | <i>guuy</i> | Nectariferous | Tree | 7 | 15,55 |
| <i>Grewia bicolor</i> Juss. (Malvaceae) | <i>Greuvier</i> (fr) <i>Kel</i> (w) | | Nectariferous- Polliniferous | Shurbs | 2 | 4,44 |
| <i>Grewia flavescens</i> Juss. (Malvaceae) | <i>Greuvier jaunatre</i> (fr) <i>horom sap</i> (w) | | Nectariferous- Polliniferous | Shurbs | 1 | 2,22 |
| <i>Hibiscus sabdariffa</i> L. (Malvaceae) | <i>Oseille de guinée</i> (fr) <i>bissap</i> (w) | | Nectariferous | Herb | 2 | 4,44 |
| <i>Sida acuta</i> Burm.f. (Malvaceae) | <i>Herbe dure</i> (fr) | | Polliniferous | Shurbs | 1 | 2,22 |
| <i>Azadirachta indica</i> A. Juss. (Meliaceae) | <i>Margousier</i> (fr) <i>Neem</i> (w) | | Nectariferous | Tree | 5 | 11,11 |
| <i>Khaya senegalensis</i> (Desr.) A. Juss. (Meliaceae) | <i>Cailcedrat</i> (fr) (w) | <i>xaay</i> | Nectariferous | Tree | 2 | 4,44 |

| | | | | | |
|--|---|---------------------------------|--------|---|------|
| <i>Moringa oleifera</i> Lam. (Moringaceae) | <i>Ben ailé (fr)</i> <i>nebeday (w)</i> | Nectariferous | Shurbs | 3 | 6,66 |
| <i>Musa sapientum</i> L. (Musaceae) | <i>Bananier (fr)</i> <i>banane (w)</i> | Nectariferous | Tree | 4 | 8,88 |
| <i>Psidium guajava</i> L. (Myrtaceae) | <i>Goyavier (fr)</i> <i>goyave (w)</i> | Nectariferous- Polliniferous | Shurbs | 1 | 2,22 |
| <i>Nymphaea lotus</i> L. (Nymphaeaceae) | <i>Nénufar (fr)</i> | Polliniferous | Herb | 1 | 2,22 |
| <i>Ziziphus mauritiana</i> Lam. (Rhamnaceae) | <i>Jujubier (fr)</i> <i>sidem</i> <i>(w)</i> | Nectariferous | Shurbs | 3 | 6,66 |
| <i>Feretia apodanthera</i> Del. (Rubiaceae) | <i>Nalafum (d)</i> | Nectariferous- Polliniferous | Shurbs | 1 | 2,22 |
| <i>Spermacoce stachydea</i> DC. (Rubiaceae) | <i>Indetermined</i> | Nectariferous- Polliniferous | Herb | 1 | 2,22 |
| <i>Citrus limonum</i> (L.) Burm. f. (Rutaceae) | <i>Citronnier (fr)</i> <i>Lemon (w)</i> | Nectariferous | Shurbs | 2 | 4,44 |
| <i>Paullinia pinnata</i> L. (Sapindaceae) | <i>Liane carrée (fr)</i> | Nectariferous- Polliniferous | Herb | 1 | 2,22 |

Fr : French ; W : Wolof

The most represented being the Fabaceae with 12 species followed by Combretaceae and Malvaceae with 6 species then Gramineae with 3 species, then Anacardiaceae, Lamiaceae, Rubiaceae and Meliaceae with 2 species and finally the Apocynaceae, Balanitaceae, Rhamnaceae, Moringaceae, Musaceae, Myrtaceae, Nymphaeaceae, Rutaceae and Sapindaceae with one species each (Fig.1).

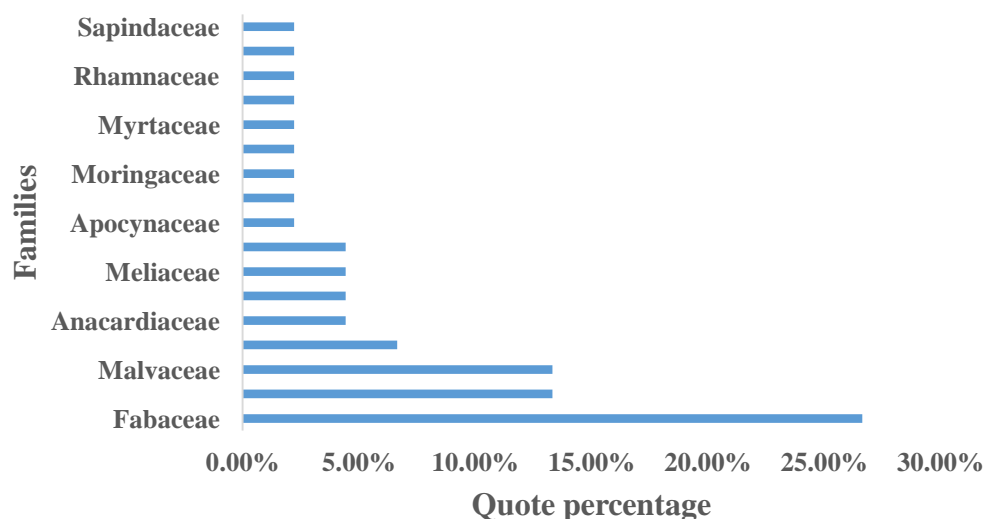


Figure 1 : Families plants species

These results are according with those of [11] and [20] who found that the families Fabaceae was the most represented. [15] has found the families Fabaceae species was the most represented. The distribution of melliferous plants according to the biological type (Fig. 2) shows that the trees are the most represented 18/45 (40%) followed by shrubs 15/45 (33.33%) herbs 11/45 (24.44%) and then lianas are less than represented 1/45 (2.22%) (Fig.2).

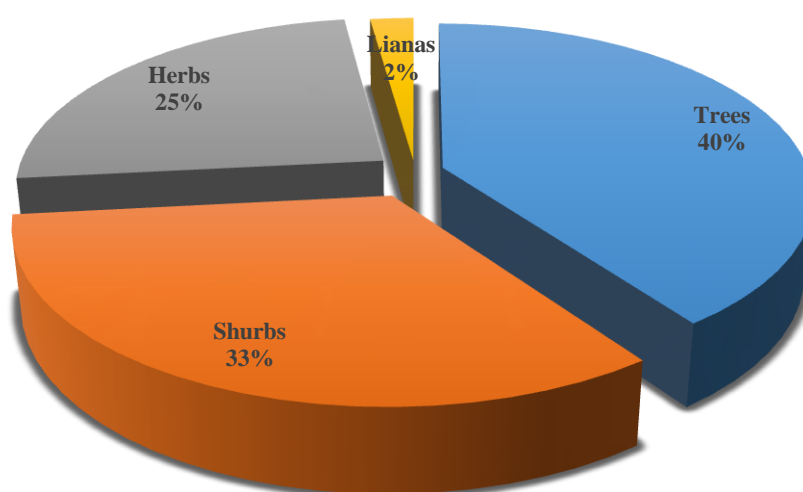


Figure 2 : Distribution of plants according to their biological type.

Note also the therapeutic interest of ligneous trees such as The most represented species *Pterocarpus erinaceus* has shown antiinflammatory, analgesic and antipyretic activity [25]. *Acacia nilotica* species that has shown antioxidant and antiinflammatory activity [22]. The *Tamarindus indica* species has shown antioxidant activity [23]. *Guiera senegalensis* (Combretaceae) has shown acaricidal properties against *Hyalomma anatolicum* [17]. *Anogeissus leiocarpus* has shown antiplasmodial and antileishmanial activities [21]. These results are not according with those of [11] found 86.89% ligneous against 13.11% herbaceous and 6.88% liana, and with results not confirm from [12] who showed a higher rate of ligneous (trees, shurbs and shrubs) of 63.5% against 36.5% of herbaceous plants and with those of [21] who found 52.8% of ligneous against 47.92% in Garanga and 57.37% of ligneous against 42.27% of herbaceous plants in Nazinga, Burkina Faso. These results are not according with those of [20] found 94% ligneous against 6% herbaceous. This difference in results could be due to the dissimilar climates of the regions. Researchers have shown that the decrease in precipitation which globally leads to the depletion of water resources [1] et [16] , the modification of natural ecosystems and socio-economic systems [19].

Regarding the distribution according to the apicultural value, the results showed that the nectariferous and nectariferous-Polliniferous represent 42.22%, followed taxa Polliniferous (13.33%) and then finally melliferous taxa (2.22%). We were to identify melliferous species in this survey (Fig. 3).

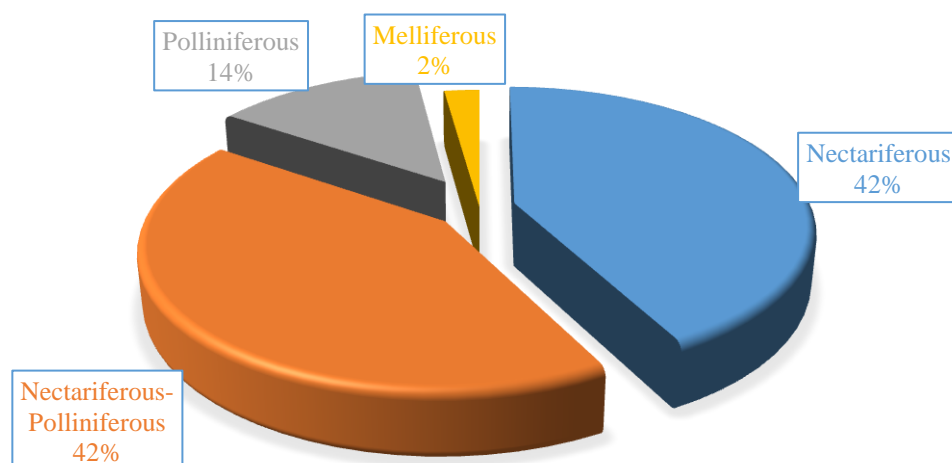


Figure 3 : Distribution of plants according to their apicol value

These results are not in according to those of [11] which showed a predominance of nectariferous taxa of 47.54% against 36.07% of nectariferous and polliniferous taxa and 14.75% of polliniferous taxa at Casamance in Sénégal. These results correspond to those obtained by [9], in Bukavu, the author shows that more than 2/3 species are foraging for their nectar, they were in agreement with those of [6] found almost equal rates of nectariferous and polliniferous nectariferous taxa, which are 40.6% and 41.5%, respectively, and its polliniferous taxon rate of 14.5% remains equal to that of our results was 14.75%. They do not according to those of [27] who found substantially equal rates of 31% nectariferous taxa, 35.6% nectariferous taxa and 33.3% polliniferous taxa. These results are not in according to those of [20] which showed a predominance of Nectariferous taxa (58.82%) against

nectariferous - polliniferous taxa (41.18%). This difference in results could be due to the dissimilar climates of the Districts. Indeed, rainfall is the most constraining climatic variable for the populations and it induces, by itself, determining effects on the environment [5]. Bees present an importance in the agricultural economy by the production of apiarian products as well as for their contribution to the pollination of the majority of the known plants.

In principle, all the species deserve beekeepers' attention as they enrich melliferous flora in the areas of their occurrence

4. CONCLUSION

A total of 45 species were registered as melliferous plants. The information collected from this survey indicates that they are aware about of the presence of melliferous plants in their areas. The Fabaceae family is the most represented and also the woody ones are more numerous than the herbs and lianas. Regarding the apicultural value, nectariferous and nectariferous-polleniferous species were more representative. Most of the plant were wild and herbs, so their conservation is necessary for utilization of generations to come. This can be done by encouraging local people for the cultivation of these plants. Furthermore, this preliminary study may be act as a baseline for the discovery of new plant-based medicines but also for the implantation of apiaries for the production of honey. These melliferous species can be studied to know the compound and these various activities.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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