ARTICLE

Ethnobotanical analysis of ornamental plant producers' knowledge in Benin: valorization and management perspectives

Análise etnobotânica do conhecimento dos produtores de plantas ornamentais no Benin: perspectivas de valorização e manejo

Mèmonsso Pierrette Pauline Deguenon[1] , Gbodja Houéhanou François Gbesso[1,*] , Etienne Romaric Adéwalé Godonou[1]

[1]Université Nationale d'Agriculture, Laboratoire des Sciences Végétales, Horticoles et Forestières, École d'Horticulture et d'Aménagement des Espaces Verts, Kétou-Plateau, Benin

Abstract: This study aimed to analyze the ethnobotanical knowledge of ornamental plant producers in Benin for better valorization. An ethnobotanical survey was conducted through semi-structured and individual interviews with 80 individuals. In total, 78 species of ornamental plants belonging to 25 botanical families were identified. The families Euphorbiaceae (15.38%), Apocynaceae (12.82%), Araceae (11.54%), and Verbenaceae (6.41%) were the most dominant. Five categories of uses were identified for ornamental plants in Benin, including aesthetic or decorative, psycho-magical, therapeutic, cosmetic, and food uses. Among these, aesthetic or decorative use of ornamental plants was widely recognized by producers (100% of surveyed producers), followed by use for psycho-magical purposes (45.7% of respondents). The frequency of citation of different categories of use varied according to the gender, age, ethnic group, and educational level of the interviewed producers. Ethnic group and educational level significantly influenced the ethnobotanical knowledge of ornamental plant producers. The first species showing a strong potential for ethnobotanical use were *Citrus aurantiifolia* (UVI = 10.78), *Lippia multiflora* (UVI = 9.70), *Ocimum basilicum* (UVI = 9.03), *Verbena bonariensis* (UVI = 8.14), *Dracaena braunii* (UVI = 8.08). These results can be considered as an important source of information for the management of the ornamental plant sector in Benin.
Keywords: Benin, cultural significance, decorative plants, ethnobiology, horticultural practices, traditional knowledge, West Africa.

Resumo: Este estudo teve como objetivo analisar o conhecimento etnobotânico dos produtores de plantas ornamentais em Benin para uma melhor valorização. Um levantamento etnobotânico foi conduzido por meio de entrevistas semiestruturadas e individuais com 80 indivíduos. No total, foram identificadas 78 espécies de plantas ornamentais pertencentes a 25 famílias botânicas. As famílias Euphorbiaceae (15,38%), Apocynaceae (12,82%), Araceae (11,54%) e Verbenaceae (6,41%) foram as mais dominantes. Cinco categorias de usos foram identificadas para plantas ornamentais em Benin, incluindo uso estético ou decorativo, psico-mágico, terapêutico, cosmético e alimentar. Entre esses, o uso estético ou decorativo de plantas ornamentais foi amplamente reconhecido pelos produtores (100% dos produtores pesquisados), seguido pelo uso para fins psico-mágicos (45,7% dos entrevistados). A frequência de citação de diferentes categorias de uso variou de acordo com o gênero, idade, grupo étnico e nível educacional dos produtores entrevistados. O grupo étnico e o nível educacional influenciaram significativamente o conhecimento etnobotânico dos produtores de plantas ornamentais. As primeiras espécies mostrando um forte potencial para uso etnobotânico foram *Citrus aurantiifolia* (UVI = 10,78), *Lippia multiflora* (UVI = 9,70), *Ocimum basilicum* (UVI = 9,03), *Verbena bonariensis* (UVI = 8,14), *Dracaena braunii* (UVI = 8,08). Esses resultados podem ser considerados como uma fonte importante de informação para o manejo do setor de plantas ornamentais em Benin.
Palavras-chave: África Ocidental, Benin, conhecimento tradicional, etnobiologia, plantas decorativas, práticas horticulturais, significado cultural.

Introduction

Ornamental plants constitute a natural living beauty that enhances the living environment of humans and represent an important group within the ornamental industry. Some of these ornamental plants provide food, shelter, or construction materials, while others provide purely visual delights (García-Ávila et al., 2023). Besides the various functions played by plants in the environment, ornamental plants have a particular role in human life for their aesthetic aspect (Radji and Kokou, 2013; Barco and Borin, 2020; Altman et al., 2022; Kycheryavyj and Popovych, 2023). They also play a role in the mental balance of humans (Hiernaux, 2021; Santos and Reis, 2021; Salachna, 2022). The importance of ornamental plants is both to humans and from an economic point of view, especially in large modern cities where rapid urbanization processes have brought forth collective housing and large constructions (Fautras and Veith, 2022; Francini et al., 2022).

Local communities have developed a whole range of knowledge and know-how regarding ornamental plants, the consideration of which is essential today (Saini et al., 2020; Janakiram et al., 2021; Hernández-Rodríguez and López-Santiago, 2022; Xu et al., 2023). This local naturalistic knowledge has now gained great legitimacy in the establishment of gardens and green spaces and is invoked, alongside other forms of scientific and technical knowledge, to participate in the development of management standards for horticultural sites (Arshad et al., 2020). It is important to protect this knowledge and know-how, as well as the plants themselves.

Despite the richness of local naturalistic knowledge, it often remains underappreciated. Numerous studies have explored indigenous medicinal plants in Benin (Kohonou et al., 2020; Azonbakin et al., 2021; Ganlaki et al., 2022; Kore et al., 2023), yet the sector of ornamental plants, particularly exotic varieties, suffers from a notable scarcity of ethnobotanical and pharmacological information. Additionally, it's crucial to acknowledge that local naturalistic knowledge within communities is not static but continually evolving. This evolution is driven by creativity, innovation, and the integration of diverse knowledge systems (Kakudidi, 2004).

It then becomes necessary to protect the local knowledge of communities and to develop strategies for sustainable management and exploitation of ornamental plant production sites. This study aims to evaluate the ethnobotanical knowledge and know-how of ornamental plant producers in Benin. The objectives include: (i) determining the diversity of ornamental plant species; (ii) identifying types of use by categories of use, and (iii) assessing the importance of categories of use of ornamental plants.

Materials and Methods

Study Area

The study was conducted in Benin, located in the intertropical zone, between latitudes 6°30' and 12°30' North and longitudes 1° and 3°40' East, with an area of 114,763 km² (Adomou, 2005). Except for the Northwest zone in the Atacora chains, Benin has relatively flat terrain. Due to its extension between the Gulf of Benin coast and the Niger Valley, the Republic of Benin presents a variety of climates characterized by the relatively low annual rainfall ranging from 900 to 1300 mm per year. The vegetation cover consists of mosaics of light forests, wooded and shrubby savannas. There are also some dry dense forests and forest galleries.

The Municipalities considered for the study are Abomey-Calavi, Bohicon, Cotonou, Dassa-Zoumè, Grand-Popo, Kpomassè, Ouidah, Parakou, Porto-Novo, Sèmè-Podji, Tori-Bossito and Zè. Table 1 shows the distribution of respondents by commune (Fig. 1).
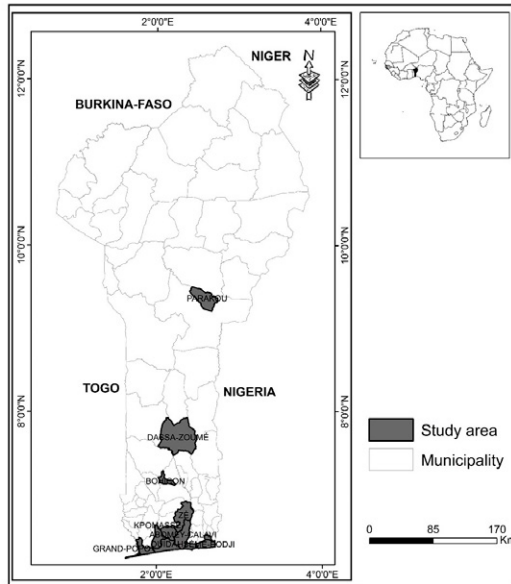

Fig. 1. Study area.

Sampling

To determine the sample size to be interviewed for each city, an exploratory study was conducted among some ornamental plant producers in each relevant municipality. The respondents were asked: "Are you aware of any use of an ornamental plant?" The number of people to be surveyed for each municipality was then determined by the normal approximation of the binomial law (Dagnelie, 1998) as follows:

$$n = \frac{U_{1-\alpha/2}^2 \, X \, p(1-p)}{d^2}$$

where P = frequency of persons knowing the ornamental plants from the preliminary survey, U1-α/2= 1.96 (normal distribution, α = 0.05) and d is the expected error margin of any parameter to be computed, which we fixed here at 0.08.

In the end, a total of 80 ornamental plant producers were randomly surveyed, and their distribution by municipality and according to sociodemographic characteristics is presented in Table 1.

Table. 1. Distribution of respondents by municipalities and socio-economic characteristics

Variables		Number	Frequency (%)
Municipality	Abomey-Calavi	10	12.5
	Bohicon	6	7.5
	Cotonou	10	12.5
	Dassa-Zoumè	4	5
	Grand-Popo	9	11.25
	Kpomassè	8	10
	Ouidah	9	11.25
	Parakou	4	5
	Porto-Novo	6	7.5
	Sèmè-Podji	9	11.25
	Tori-Bossito	3	3.75
	Zè	2	2.5
Gender	Female	18	22.5
	Male	62	77.5
Age group	Adult	58	72.5
	Juvenile	16	20
	Old man	6	7.5
Sociolinguistic group	Dendi	4	5
	Fon	35	43.75
	Goun	15	18.75
	Idatcha	4	5
	Kotafon	8	10
	Ouémè	5	6.25
	Xwla	9	11.25
Educational attainment	Primary school	14	17.5
	Secondary School	58	72.5
	University	8	10

(**Note:** "Number" refers to the number of respondents, and "Frequency (%)" indicates the percentage frequency).

Ethnobotanical Data Collection

For the data collection, structured surveys were conducted based on an individual survey form integrated into Android application ''KoBo Toolbox''. KoBo Toolbox is adata collection tool. The collected data include:

- Socio-demographic characteristics of the respondents (ethnicity, gender, age, education level)
- Forms of usage of the species (food, cosmetic, psycho-magic, therapeutic, and aesthetic). The psycho-magical properties of these plants allow them to interact with the unconscious and treat mystical illnesses.

- The importance of using a species in each category of usage based on the following scale: 3 = heavily used in the respective category; 2 = moderately used in the respective category; 1 = species lightly used in the respective category; 0 = not used for this category of usage.
- The socio-cultural importance of ornamental plant production in Benin.

Ethnobotanical Data Analysis

The collected data were processed, encoded, and analyzed using Excel spreadsheet and statistical software such as R and Minitab. The calculated ethnobotanical indices are summarized in Table 2.

Table 2. Estimated Ethnobotanical Indices

Indices	Calculations	Description	References
Frequency of Citation of Usage Categories (FUE) $$FUE = \frac{n_i}{N} \times 100$$	FUE: Frequency of citation of usage categories; (n_i): number of individuals who cited the same usage category for ornamental plants; N: total number of individuals surveyed in the study area. FUE varies from 0 to 100%. A value of 0 indicates that ornamental plants are not used in this category, and 100% indicates usage by all respondents.	Determines the most important usage categories for ornamental plants based on the frequency of citation.	Dossou et al. (2012)
Species Usage Value (VU) $$VU(i) = \frac{\sum_i^n si}{n}$$	: sum of usage scores assigned by respondents divided by the number of respondents per usage category (n). The scoring scale used is: 3 = heavily used species; 2 = moderately used species; 1 = lightly used species; 0 = species without usage.	Determines significantly the usage category with a high usage value.	Lykke et al. (2004)
Total Usage Value VUT $$\sum_i^c vu$$	VUT: sum of usage values for all usage categories. For each species, the total ethnobotanical usage value for the five categories considered in this study ranges from 0 (minimum) to 15 (maximum).		Lykke et al. (2004)

The Excel 2007 spreadsheet was used to calculate the mean usage scores for categories. Subsequently, these usage values were grouped by ethnicity, gender, and age category to test the different variables that significantly influence species usage.

To do this, the Chi-square test (Plackett, 1983) was conducted in Minitab to confirm the significance of relationships. Non-parametric tests such as Kruskal-Wallis and Mann-Whitney were performed to measure the degree of significance of ethnobotanical usage values according to municipality, gender, age, and ethnicity. These parameters indicate how ornamental plants are used and how knowledge about their usage is shared among respondents (Koura et al., 2011).

Matrices of the relative frequency of citation linking usage categories and types of usage were subjected to Correspondence Factor Analysis (CFA) in the R software (R Core Team, 2022) to describe the relationships between usage categories and types of usage.

Results

Diversity of Ornamental Plants

Seventy-eight species have been identified as ornamental plants with socio-cultural value. These plants are distributed among 25 botanical families (Table 3). The families Euphorbiaceae (15.38%), Apocynaceae (12.82%), Araceae (11.54%), and Verbenaceae (6.41%) are the most dominant (Fig. 2).
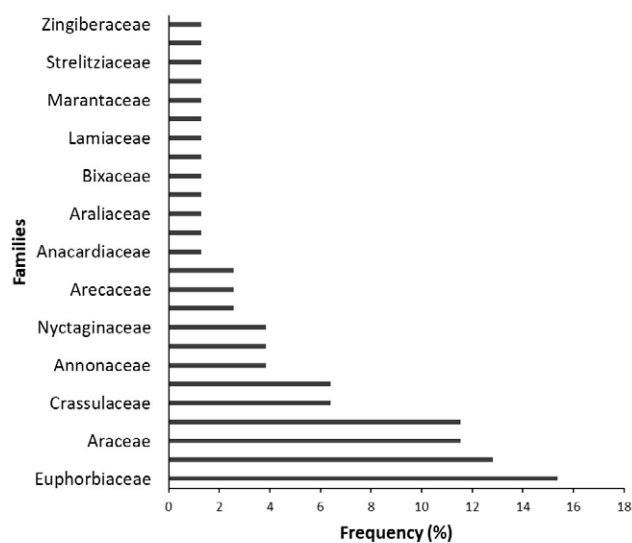

Fig. 2. Distribution of ornamental by families

Table 3 highlights the diversity and multifaceted uses of ornamental plants in Benin, categorizing them across five usage categories: Food, Cosmetics, Psycho-magic, Therapeutics, and Esthetics. The majority of the plants are primarily used for esthetic purposes, emphasizing their ornamental value. Notably, *Citrus aurantiifolia* stands out for its versatility, being used in all categories, while other plants like *Calotropis procera* and *Mangifera indica* also show significant therapeutic uses. The table underscores the rich botanical diversity and the importance of these plants in traditional medicine, cultural practices, and their potential for broader applications in cosmetics and food.

Table 3. Diversity and usage categories of identified ornamental plants

Scientific Name	Family	Usage categories				
		1	2	3	4	5
Abrus precatorius L.	Fabaceae			x		x
Acalypha hispida Burm.f.	Euphorbiaceae					x
Acalypha siamensis Oliv. *ex* Gage	Euphorbiaceae					x
Acalypha wilkesiana Müll. Arg.	Euphorbiaceae					x
Adenium obesum (Forssk.) Roem. & Schult.	Apocynaceae					x
Adonidia mirilii (Becc.) Becc.	Arecaceae					x
Aglaonema lipstick	Araceae					x
Allamanda cathartica L.	Apocynaceae					x
Allamanda schottii Pohl	Apocynaceae					x
Aloe vera (L.) Burm.f.	Xanthorrhoeaceae				x	x
Annona muricata L.	Annonaceae				x	x
Anthurium digitatum (Jacq.) Schott	Araceae					x
Araucaria laubenfelsii de Laub.	Araucariaceae					x
Araucaria nemorosa de Laub.	Araucariaceae					x
Artemisia schmidtiana Maxim.	Asteraceae					x
Bambusa vulgaris Schrad. *ex* J.C. Wendl.	Poaceae					x
Bixa Orellana L.	Bixaceae					x
Bougainvillea glabra Choisy	Nyctaginaceae					x
Bougainvillea spectabilis Willd.	Nyctaginaceae			x	x	x
Bryophyllum pinnatum (Lam.) Oken	Crassulaceae			x	x	x
Caesalpinia pulcherrima L.	Fabaceae			x		x
Caladium bicolor (Aiton) Vent.	Araceae			x		x
Calathea zebrine (Sims) Lindl.	Marantaceae					x
Calotropis procera (Aiton) W.T. Aiton	Apocynaceae			x	x	x
Cananga odorata (Lam.) Hook. f. & Thomson	Annonaceae		x	x		x
Cascabela thevetia (L.) Lippold	Apocynaceae			x	x	x
Catharanthus roseus (L.) G. Don	Apocynaceae			x		x
Centella asiatica (L.) Urb.	Apiaceae			x		x
Citrus aurantiifolia (Christm.) Swingle	Rutaceae	x	x	x	x	x
Cocos nucifera L.	Arecaceae			x	x	x
Codiaeum variegatum (L.) A. Juss.	Euphorbiaceae				x	x
Colocasia esculenta (L.) Schott	Araceae	x				x
Croton gratissimus Burch.	Euphorbiaceae			x	x	x
Cymbopogon citratus (DC.) Stapf	Poaceae			x		x
Delonix regia (Hook.) Raf.	Caesalpiniaceae			x		x
Dracaena arborea (Willd.) Link	Asparagaceae			x	x	x
Dracaena braunii Engl. & K. Krause	Asparagaceae			x	x	x
Dracaena fragans (L.) Ker Gawl.	Asparagaceae			x	x	x
Dracaena sanderiana Sander *ex* Mast.	Asparagaceae			x	x	x

Species	Family	1	2	3	4	5
Dracaena surculosa Lindl	Asparagaceae			x	x	x
Epipremnum aureum (Linden & André) G.S. Bunting	Araceae			x		x
Erythrina variegate L.	Fabaceae			x		x
Euphorbia lacteal Haw.	Euphorbiaceae			x		x
Euphorbia milii Des Moul.	Euphorbiaceae			x		x
Euphorbia tirucalli L.	Euphorbiaceae			x		x
Jatropha gossypiifolia L.	Euphorbiaceae			x	x	x
Jatropha integerrima Jacq.	Euphorbiaceae			x		x
Jatropha multifidi L.	Euphorbiaceae			x		x
Jatropha podagrica Hook.	Euphorbiaceae			x		x
Kalanchoe crenata (Andrews) Haw.	Crassulaceae			x	x	x
Kalanchoe daigremontiana Raym.-Hamet & H. Perrier	Crassulaceae			x		x
Kalanchoe pinnata (Lam.) Pers.	Crassulaceae			x	x	x
Kalanchoe thyrsiflora Harv.	Crassulaceae			x	x	x
Lantana camara L.	Verbenaceae			x		x
Lippia mutiflora Moldenke	Verbenaceae	x		x	x	x
Mangifera indica L.	Anacardiaceae	x			x	x
Mirabilis jalapa L.	Nyctaginaceae			x	x	x
Nerium oleander L.	Apocynaceae					x
Ocimum basilicum L.	Lamiaceae		x	x	x	x
Orbea variegate (L.) Haw.	Apocynaceae			x		x
Pachira aquatic Aubl.	Malvaceae			x		x
Philodendron hederaceum (Jacq.) Schott	Araceae			x		x
Plumeria obtuse L.	Apocynaceae					x
Polyalthia longifolia (Sonn.) Thwaites	Annonaceae			x	x	x
Ravenala madagascariensis Sonn.	Strelitziaceae			x		x
Sansevieria cylindrical Bojer *ex* Hook.	Asparagaceae			x		x
Sansevieria liberica Gérôme & Labroy	Asparagaceae			x		x
Sansevieria trifasciata Prain	Asparagaceae			x		x
Schefflera arboricola (Hayata) Merr.	Araliaceae			x		x
Spathiphyllum wallisii Regel	Araceae			x		x
Stachytarpheta jamaicensis (L.) Vahl	Verbenaceae			x		x
Syngonium auritum (L.) Schott	Araceae			x		x
Thevetia neriifolia Juss. ex Steud.	Apocynaceae				x	x
Verbena bonariensis L.	Verbenaceae			x	x	x
Verbena officinalis L.	Verbenaceae			x	x	x
Yucca aloifolia L.	Asparagaceae			x	x	x
Zamioculcas zamiifolia (Lodd.) Engl.	Araceae			x		x
Zingiber zerumbet (L.) Sm.	Zingiberaceae			x		x

1= Food, 2= Cosmetics, 3= Psycho-magic, 4= Therapeutics, 5= Esthetics

Importance of the Categories of Usage of Cultivated Ornamental Plants

Five key use categories have been identified by surveyed producers: aesthetic, psycho-magical, therapeutic, cosmetic, and food uses. The 100% of producers recognize the aesthetic or decorative use, and 45.7% acknowledge the psycho-magical properties of these plants, utilizing them to interact with the unconscious and treat mystical ailments. Additionally, 15% of respondents are aware of their therapeutic benefits in treating diseases, about 13.75% use these plants in beauty preparations such as perfumes and skin creams, and 10% recognize their use in food, either as edible ingredients or flavor enhancers (Fig. 3). These findings underscore the multifunctional roles of ornamental plants in Benin, spanning from everyday aesthetics to complex cultural and medicinal applications.
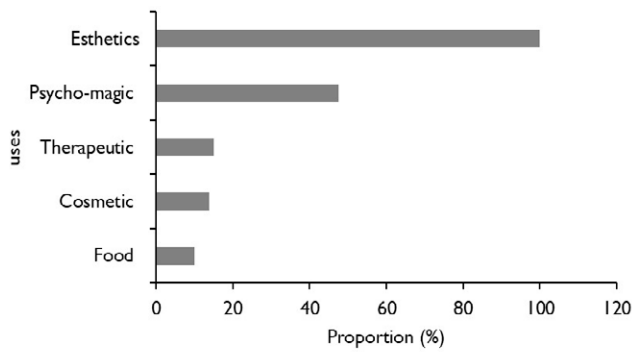
Fig. 3. Forms of usage of ornamental plants

Table 4 further analyzes the frequency of citations for each usage category based on sociodemographic characteristics such as gender, age, ethnic group, and level of education. The chi-square test reveals significant influences of gender (Chi-Sq = 15.871; p-Value = 0.044), ethnic group (Chi-Sq = 125.779; p-Value = 0.0001), and level of education (Chi-Sq = 33.732; p-Value = 0.0001) on the knowledge of these uses. Notably, males and adults report higher recognition of psycho-magical uses (50%), while older individuals predominantly cite this category (66.67%). Among ethnic groups, the Kotafon (62.5%) and Xwla (66.67%) notably highlight the cosmetic and psycho-magical uses, respectively. Educational level also plays a role, with primary-educated individuals predominantly recognizing psycho-magical properties (64.29%), while academically educated individuals frequently cite cosmetic uses (50%). These findings underscore the varied and culturally embedded knowledge of ornamental plant uses across different sociodemographic groups in Benin.

Table 4. Frequency of citation per category of usage according to the sociodemographic characteristics of the surveyed producers.

Sociodemographic Characteristics	Citation frequency/Usage category (%)					Chi-Square Test
	Food	Cosmetics	Psycho-magic	Therapeutics	Aesthetics	
Female	16.67	16.67	38.89	16.67	100	Chi-Sq = 1.960; p-Value = 0.743
Male	8.06	12.90	50.00	14.52	100	
Adult	12.07	15.52	50.00	18.97	100	Chi-Sq = 15.871; p-Value = 0.044
Young	6.25	12.50	31.25	6.25	100	
Old	0.00	0.00	66.67	0.00	100	
Dendi	0.00	25.00	50.00	0.00	100	Chi-Sq = 125.779; p-Value = 0.0001
Fon	14.29	8.57	45.71	14.29	100	
Goun	0.00	13.33	60.00	20.00	100	
Idatcha	25.00	0.00	25.00	25.00	100	
Kotafon	12.50	62.50	25.00	0.00	100	
Ouémè	0.00	0.00	40.00	40.00	100	
Xwla	11.11	0.00	66.67	11.11	100	
Primary	7.14	14.29	64.29	7.14	100	Chi-Sq = 33.732; p-Value = 0.0001
Secondary	10.34	8.62	46.55	18.97	100	
Academic	12.50	50.00	25.00	0.00	100	

Type of usage by categories of usage

The types of usage of ornamental plants vary according to their broad categories of usage. Correspondence analysis (CA) was used to characterize each category of usage based on the types of usage. The first two components explain 56.05% of the information on the types of usage of ornamental plant species in each category of usage (Fig. 4). Thus, the observation of Figure 4 shows that in the psycho-magical usage category, plants are used for harmony in the house, purifying places, warding off evil spirits, and the harmful effects of sorcery. Among the plants cited for their psycho-magical properties are *Calotropis procera*, *Caladium bicolor*, *Dracaena arborea*, *Mirabilis jalapa*, *Jatropha gossypiifolia*, *Croton gratissimus*, and *Euphorbia milii*. Other ornamental plants have been cited as having therapeutic properties, namely *Jatropha gossypiifolia* and *Croton gratissimus*.
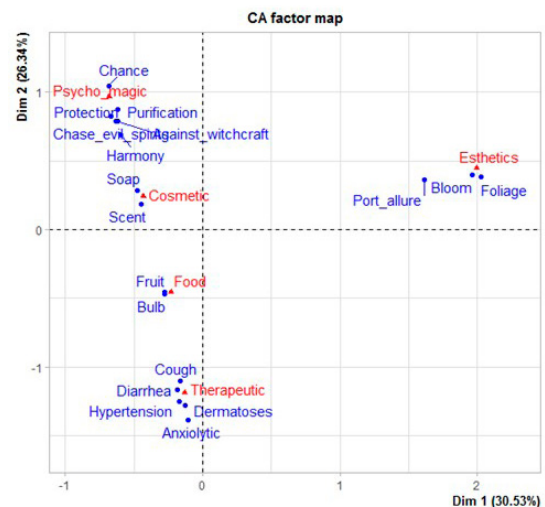

Fig. 4. Projection of Usage Categories and Forms of Usage on Axes 1 and 2 of the factorial planes of the CA.

Ethnobotanical usage values of ornamental plants

Table 5 presents the ethnobotanical usage values of the enumerated ornamental plants. The first ten species with strong ethnobotanical usage potential are respectively *Citrus aurantiifolia* (VUT = 10.78), *Lippia mutiflora* (VUT = 9.70), *Ocimum basilicum* (VUT = 9.03), *Verbena bonariensis* (VUT = 8.14), *Dracaena braunii* (VUT = 8.08), *Bougainvillea spectabilis*, *Calotropis procera*, *Cocos nucifera*, *Polyalthia longifolia* (VUT = 8), and *Dracaena sanderiana* (VUT = 7.91). The Kruskal-Wallis test shows that ethnobotanical knowledge related to the usage of ornamental plants does not differ significantly according to the age of the respondents (H = 1.62, DF = 2, p = 0.446) and the level of education (H = 0.21, DF = 2, p = 0.901). However, this knowledge differs significantly according to ethnic group (H = 45.12, DF = 6, p = 0.0001) and gender (W = 382489.5, p = 0.001; Mann-Whitney Test). In summary, ethnobotanical knowledge of ornamental plants varies according to gender and ethnic group.

Table 5. Ethnobotanical use value of ornamental plants.

Species (scientific name)	Ethnobotanical use value					Total Ethnobotani-cal Use Value	Rank
	Food	Cosmetics	Psycho-magic	Therapeutics	Aesthetics		
Citrus aurantiifolia	2.04	1.00	2.74	2.00	3.00	10.78	1
Lippia mutiflora	2.07	0.00	2.63	2.00	3.00	9.70	2
Ocimum basilicum	0.00	1.00	2.97	2.07	3.00	9.03	3
Verbena bonariensis	0.00	0.00	3.00	2.14	3.00	8.14	4
Dracaena braunii	0.00	0.00	2.88	2.21	3.00	8.08	5
Bougainvillea spectabilis	0.00	0.00	2.91	2.09	3.00	8.00	6
Calotropis procera	0.00	0.00	3.00	2.00	3.00	8.00	7
Cocos nucifera	0.00	0.00	2.83	2.17	3.00	8.00	8
Polyalthia longifolia	0.00	0.00	2.93	2.00	3.00	7.93	9
Dracaena sanderiana	0.00	0.00	2.81	2.09	3.00	7.91	10
Jatropha gossypiifolia	0.00	0.00	2.89	2.00	3.00	7.89	11
Mirabilis jalapa	0.00	0.00	2.73	2.10	3.00	7.83	12
Kalanchoe pinnata	0.00	0.00	2.86	2.00	2.96	7.82	13
Kalanchoe thyrsiflora	0.00	0.00	2.64	2.18	3.00	7.82	14
Bryophyllum pinnatum	0.00	0.00	2.68	2.14	3.00	7.82	15
Dracaena fragans	0.00	0.00	2.66	2.16	3.00	7.81	16
Croton gratissimus	0.00	0.00	2.88	1.96	2.96	7.79	17
Kalanchoe crenata	0.00	0.00	2.75	2.00	3.00	7.75	18
Yucca aloifolia	0.00	0.00	2.59	2.14	3.00	7.73	19
Cascabela thevetia	0.00	0.00	2.64	2.05	2.95	7.64	20
Dracaena surculosa	0.00	0.00	2.61	2.03	2.97	7.61	21
Verbena officinalis	0.00	0.00	2.55	2.05	3.00	7.59	22
Dracaena arborea	0.00	0.00	2.50	2.00	3.00	7.50	23
Mangifera indica	2.04	0.00	0.07	2.22	2.96	7.30	24
Cananga odorata	0.00	1.00	2.64	0.00	3.00	6.64	25
Caesalpinia pulcherrima	0.00	0.00	2.95	0.00	3.00	5.95	26
Centella asiatica	0.00	0.00	2.86	0.00	3.00	5.86	27
Dolonix regia	0.00	0.00	2.83	0.00	3.00	5.83	28
Euphorbia milii	0.00	0.00	2.80	0.00	3.00	5.80	29
Lantana camara	0.00	0.00	2.79	0.00	3.00	5.79	30
Caladium bicolor	0.00	0.00	2.77	0.00	3.00	5.77	31
Orbea variegata	0.00	0.00	2.67	0.10	3.00	5.77	32
Pachira aquatica	0.00	0.00	2.73	0.00	3.00	5.73	33
Ravenala madagascariensis	0.00	0.00	2.73	0.00	3.00	5.73	34
Jatropha multifida	0.00	0.00	2.71	0.00	3.00	5.71	35
Jatropha podagrica	0.00	0.00	2.71	0.00	3.00	5.71	36
Cymbopogon citratus	0.00	0.00	2.71	0.00	3.00	5.71	37
Erythrina variegata	0.00	0.00	2.70	0.00	3.00	5.70	38

Philodendron hederaceum	0.00	0.00	2.70	0.00	3.00	5.70	39
Stachytarpheta jamaicensis	0.00	0.00	2.68	0.00	3.00	5.68	40
Kalanchoe daigremontiana	0.00	0.00	2.68	0.00	3.00	5.68	41
Sansevieria cylindrica	0.00	0.00	2.67	0.00	3.00	5.67	42
Schefflera arboricola	0.00	0.00	2.67	0.00	3.00	5.67	43
Sansevieria liberica	0.00	0.00	2.63	0.00	3.00	5.63	44
Abrus precatorius	0.00	0.00	2.63	0.00	3.00	5.63	45
Epipremnum aureum	0.00	0.00	2.61	0.00	3.00	5.61	46
Sansevieria trifasciata	0.00	0.00	2.60	0.00	3.00	5.60	47
Catharanthus roseus	0.00	0.00	2.59	0.00	3.00	5.59	48
Jatropha integerrima	0.00	0.00	2.61	0.00	2.96	5.57	49
Spathiphyllum wallisii	0.00	0.00	2.55	0.00	3.00	5.55	50
Syngonium auritum	0.00	0.00	2.55	0.00	3.00	5.55	51
Euphorbia lactea	0.00	0.00	2.53	0.00	3.00	5.53	52
Euphorbia tirucalli	0.00	0.00	2.43	0.00	3.00	5.43	53
Codiaeum variegatum	0.00	0.00	0.00	2.09	3.00	5.09	54
Colocasia esculenta	2.09	0.00	0.00	0.00	3.00	5.09	55
Aloe vera	0.00	0.00	0.00	2.00	3.00	5.00	56
Thevetia neriifolia	0.00	0.00	0.00	1.91	3.00	4.91	57
Annona muricata	0.00	0.00	0.00	1.94	2.94	4.88	58
Acalypha hispida	0.00	0.00	0.00	0.00	3.00	3.00	59
Acalypha siamensis	0.00	0.00	0.00	0.00	3.00	3.00	60
Acalypha wilkesiana	0.00	0.00	0.00	0.00	3.00	3.00	61
Adonidia mirilii	0.00	0.00	0.00	0.00	3.00	3.00	62
Aglaonema lipstick	0.00	0.00	0.00	0.00	3.00	3.00	63
Allamanda cathartica	0.00	0.00	0.00	0.00	3.00	3.00	64
Allamanda schottii	0.00	0.00	0.00	0.00	3.00	3.00	65
Anthurium digitatum	0.00	0.00	0.00	0.00	3.00	3.00	66
Araucaria laubenfelsii	0.00	0.00	0.00	0.00	3.00	3.00	67
Araucaria nemorosa	0.00	0.00	0.00	0.00	3.00	3.00	68
Artemisia schmidtiana	0.00	0.00	0.00	0.00	3.00	3.00	69
Bambusa vulgaris	0.00	0.00	0.00	0.00	3.00	3.00	70
Bixa orellana	0.00	0.00	0.00	0.00	3.00	3.00	71
Calathea zebrina	0.00	0.00	0.00	0.00	3.00	3.00	72
Nerium oleander	0.00	0.00	0.00	0.00	3.00	3.00	73
Plumeria obtusa	0.00	0.00	0.00	0.00	3.00	3.00	74
Bougainvillea glabra	0.00	0.00	0.00	0.00	2.94	2.94	75
Adenium obesum	0.00	0.00	0.00	0.00	2.88	2.88	76

Discussion

Diversity of ornamental plants and categories of usage

The ornamental plants in Benin serve multiple purposes, including psycho-magic, therapeutic, cosmetic, and food uses. The citation frequency of these categories varies by gender, age, ethnic group, and education level of the producers. This variability is consistent with previous research indicating that socio-economic factors significantly influence ethnobotanical knowledge (Dossou et al., 2012; Jerneck and Olsson, 2013; Liyama et al., 2017; Sanou et al., 2017). Understanding the relationship between these socio-economic factors and plant usage knowledge is crucial for appreciating the cultural and practical roles of these plants. For instance, Jerneck and Olsson (2013) discuss how gender and social roles influence access to and knowledge of plant resources, while Liyama et al. (2017) highlight the impact of educational level on the depth of ethnobotanical knowledge.

The value attributed to ornamental plants is closely tied to their utility across various usage categories. The assessment of ethnobotanical knowledge among producers highlighted species with high usage values, such as *Citrus aurantiifolia*, *Lippia multiflora*, *Ocimum basilicum*, *Verbena bonariensis*, *Dracaena braunii*, *Bougainvillea spectabilis*, *Calotropis procera*, *Cocos nucifera*, *Polyalthia longifolia*, and *Dracaena sanderiana*. These plants are valued not merely for their availability but for their ability to meet diverse needs, particularly in psycho-magic practices. This usage involves planting species to protect environments from negative influences and to attract positive energies, such as luck and harmony.

This dual focus on aesthetic and mythical attributes reflects the complex motivations of ornamental plant consumers in Benin. While the aesthetic appeal of these plants is undeniable, their perceived mystical powers are equally significant, showcasing a blend of cultural beliefs and practical applications in plant usage. Similar findings are noted in other regions where cultural beliefs significantly influence plant usage patterns (van Andel et al., 2015; Voeks and Leony, 2004). The integration of these plants into everyday life highlights their multifunctional role, extending beyond decoration to include cultural, therapeutic, and even culinary dimensions.

Sociodemographic influences on ethnobotanical knowledge

The results of the study indicate that the effect of age and ethnicities on the knowledge and usage of ornamental plants is statistically significant. this is evidenced by the study findings of (Lingani, 2011; Jerneck and Olsson, 2013; Liyama et al., 2017; Sanou et al., 2017) which explain that ethnic groups differ in their religious habits, their know-how, their manners of living that are transmitted from generation to generation (Donou Hounsode et al., 2016). We therefore observe differences in the perception and use of ornamental plants depending on ethnic groups. This proves that certain ethnic groups are more inclined towards the use of a usage category than others. Therefore, it is important to understand the relationship between ethnic groups, age, and ethnobotanical knowledge to improve the sustainability of this knowledge and generational transmission.

Conclusions and Perspectives

This ethnobotanical study of cultivated ornamental plants in Benin has illuminated the rich floristic diversity and varied uses of these plants within Beninese society. These plants are utilized for a range of purposes, including aesthetic, psycho-magical, therapeutic, alimentary, and cosmetic uses, underscoring their cultural and socio-economic importance in the daily lives of the population.

The findings of this study are crucial for Benin as they offer valuable insights into the ethnobotanical knowledge of ornamental plant producers, which can be leveraged for better management and valorization of these plants. By understanding the diverse uses and cultural significance of ornamental plants, strategies can be developed to promote sustainable horticultural practices that preserve biodiversity and respect traditional knowledge.

However, further research is necessary to deepen our understanding of traditional practices associated with the use of ornamental plants, particularly their psycho-magical and therapeutic properties. Additionally, exploring the socio-economic and cultural factors that influence consumer preferences and perceptions toward ornamental plants can help in developing effective valorization strategies.

Awareness and training initiatives should be implemented to promote the sustainable use of ornamental plants, with a focus on biodiversity preservation and the integration of traditional knowledge. Interdisciplinary collaborations among botanists, ethnobotanists, sociologists, and economists are essential to adopt a holistic approach to studying ornamental plants, encompassing biological, cultural, economic, and environmental aspects.

This study paves the way for future research and actions aimed at valorizing and preserving the ethnobotanical richness of ornamental plants in Benin, thereby contributing to sustainable development and biodiversity conservation.

Author contributions

MPPD: conceptualization, methodology, investigation, data curation, Writing – Original Draft, Writing – Review & Editing. **GHFG:** conceptualization, validation, methodology, resources, writing-reviewing and editing, supervision. **ERAG:** investigation, data curation, Writing – Review & Editing.

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