INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 26, No. 2, p. 126-138, 2025

RESEARCH PAPER OPEN ACCESS

Lianas introduced and naturalized from Côte d'ivoire: diversity, origin and uses

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Key words: Exotic lianas, Uses, Introduced flora, Diversity, Côte d'Ivoire

http://dx.doi.org/10.12692/ijb/26.2.126-138 Article published on February 08, 2025

Abstract

Lianas have a significant interest in the life of human populations. However, they are rarely addressed in floristic studies. The objective of this study is to analyze the diversity of the lianas introduced in Côte d'Ivoire and to determine the potential uses that populations can make of them. The methodology used consists of a bibliographical synthesis. Thus, published books and articles as well as national, regional and international online databases were consulted. A total of 136 species of lianas belonging to 85 genera and divided into 36 families have been recorded. The most prominent families are: Fabaceae, Convolvulaceae, Cucurbitaceae and Apocynaceae. The introduced lianas are dominated by microphanerophytes (79%). They come from 2 continents (Americas and Asia). They are all terrestrial dicotyledon angiosperms and are dominated by herbaceous plants (54%). One hundred and sixteen (116) introduced lianas (85%) were identified as having a use by the populations. Sixty-seven (67) lianas (49%) of all species have ornamental use, 57 lianas (42%) have medicinal use and 40 lianas (29%) have food use. All organs of lianas are taken by the populations for the main uses. These are leaves, roots, bark, seeds, flowers, fruits and stems. These studies are preliminary studies on the important role of lianas introduced in the life of the Ivorian populations.

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Introduction

An exotic taxon is a taxon intentionally or accidentally introduced into a territory or part of the territory where it was previously absent (Falk-Petersen *et al.*, 2006; Brown, 2007). Some of these introduced species manage to settle in their new environment, acclimate to new environmental conditions, reproduce and form new viable populations without human assistance (Pieret *et al.*, 2008). They are called naturalized. According to Blackburn *et al.* (2011), there are now more than 13,000 species of exotic plants that have successfully naturalized outside their original range. Among these introduced plants, lianas, whether woody or herbaceous, occupy an important place (Missa *et al.*, 2023). In addition to their direct contribution to biodiversity, lianas are widely known plants and used in their distribution areas by local populations especially for medicinal and food purposes (Tra Bi, 2002; Tra Bi *et al.*, 2005; Eilu and Bukenya-Zirabab, 2004; Kouamé and Gnahoua, 2008; Missa *et al.* 2023). Indeed, their fruits are highly prized in food, pharmacopoeia and crafts (Putz and Mooney, 1991; Ambé, 2001).

In Côte d'Ivoire, the importance of lianas is undeniable and perceptible at various levels. Tra Bi (2002) found that lianas play an important role in caring for populations in classified forest areas and that their exploitation in the pharmacopoeia is varied and diversified. They continue to cover a significant proportion of the basic needs of populations without money or remote from urban centers. Therefore, several studies have addressed the uses of lianas in populations, such as medications, feeding etc... (Tra Bi, 2002; Tra Bi *et al.*, 2005; Kouamé and Gnahoua, 2008; Koffi *et al.*, 2021). However, there is no work on the diversity of introduced lianas, their origin and the uses made of these species by populations. Thus, several questions arise from this study: (1) What is the diversity of the introduced or exotic lianas of Côte d'Ivoire? (2) What is the origin of these lianas? (3) What uses can the Ivorian population make of them? The general objective of this study is to improve knowledge about the introduced flora from Côte d'Ivoire. More specifically, it will be (1) to assess the diversity of the lianas introduced from Côte d'Ivoire (2) to analyze the origin of these plants and (3) to determine the potential uses that populations can make of them.

Material and methods

Study site

Côte d'Ivoire is located in West Africa between 4°30 and 10°30 latitude North and 2°30 and 8°30 longitude West (Fig. 1.). It covers an area of about 322 462 km2 (RGPH, 2014). The soils of the Ivorian territory are grouped into four groups: ferralsols, ferruginous soils, basal rock soils with zones of armour-bearing, hydromorphic soils or coastal soils (Perraud, 1971; FAO, 2006). The terrain is flat and not very rugged, consisting of plains and plateaus with the exception of the western part of the country, which has a mountainous relief. Côte d'Ivoire is characterized by four types of climate: subequatorial, humid tropical, tropical and temperate (Eldin, 1971; Avit *et al.*, 1999; Peel, 2007). Two types of vegetation characterize the Ivorian landscape. Vegetation dominated by different savanna facies in the north to an increasingly dense equatorial forest in the south (Guillaumet and Adjanohoun, 1971).

Data collection

Inventory of introduced or exotic plants from Côte d'Ivoire

The list of introduced plants was compiled from a bibliographical synthesis of work carried out on plant species in Côte d'Ivoire. It involved consulting the database of the national herbarium of Côte d'Ivoire and several international online databases. These include the Global Invasive Species Database (www.issg.org/database/welcome), CABI's Invasive Species Collection (www.cabi.org/isc/), GRIIS (http://www.griis.org), GloNAF (https://glonaf.org), GBIF (https://www.gbif.org) and the West African invasive plant list (http://issg.org/pdf/puplications/GISP/Resources/wAfrica-EN.pdf). Then, some master's and thesis work as well as articles and scientific reports on the floristic diversity in Côte d'Ivoire were consulted. These include the work of: Kouadio, 2016; N'Guessan, 2018;

Kouamé, 2020; Nomel, 2020), (Egnankou, 1995; 2015 ; Gautier *et al.*, 1999; Aké-Assi, 2001; 2002 ; Neuba *et al.*, 2014 ; Noba *et al.* 2017; Adou *et al.*, 2018; Dogba *et al.*, 2018; Tiébré and Gouli Gnanazan, 2018; Kouassi *et al.*, 2018; Akaffou *et al.*, 2019; Asseh *et al.*, 2019; Van der Meersch *et al.*, 2021; Tiébré *et al.*, 2024; De Foresta, 1995; IUCN/PACO, 2013. The data from the various databases above have allowed to generate a provisional list of plants introduced from Côte d'Ivoire. Then, the websites (https://powo.science.kew.org/et http://africanplantdatabase.ch.), allowed us to verify the origin of each plant and the countries in which these plants were introduced. Finally, this step allowed us to generate the final list of plants introduced and naturalized in Côte d'Ivoire.

Fig 1. Study area.
(Côte d'Ivoire: maps and facts - World Atlas).

Inventory of ivorian lianas introduced

The list of introduced lianas from Côte d'Ivoire was taken from that of introduced and naturalized plants from Côte d'Ivoire based on the determination of morphological types. Botanical works (Raunkiaer, 1934; Aké-Assi, 2001; 2002) were used as a reference. The names of listed species have been updated from Lebrun and Stork (1991-1997). The nomenclature adopted for families is that of APG IV (2016).

Data analysis

The families, genera, subspecies or variety and names of authors were determined using the methods of (Lebrun and Stork, 1991-1997; Aké-Assi, 2001; 2002; APG IV, 2016). For each identified species, the biological type, subphylum, cotyledon type, origin, longevity, habitat and morphological type were determined. Botanical references (Raunkiaer, 1934; Aké-Assi, 2001; 2002; Fourdrigniez and Meyer, 2008) were consulted for classification.

The conservation value of the introduced lianas was assessed by taking into account species endemic to their home areas and those listed as rare and threatened by IUCN (2024). The origin of the introduced plants was analysed through a spectrum and histogram from the continents of origin of each species. The study also looked at the uses of lianas

and the different parts used. The uses of lianas were determined from personal knowledge and the following works: N'Dri, 1986; Aké-Assi and Sita-Guinko, 1991; Gautier-Béguin, 1992; N'Guessan, 1995; Kouamé, 2000; Tra Bi, 2002; Tra Bi *et al.*, 2005; Eilu and Bukenya-Zirabab, 2004; Kouamé and Gnahoua, 2008; Atato *et al.*, 2012 ; Koffi *et al.*, 2021.

Results

Floristic richness and composition

The Ivorian flora is rich in 1003 introduced species belonging to 609 genera and divided into 154 families. A total of 136 introduced lianas species belonging to 85 genera and divided into 36 families were recorded. The dominant genera are: *Ipomoea* (9 species, or 7%), *Merremia, Mimosa* and *Passiflora* (5 species each, or 4%).

The most important families (Fig. 2.) are: Fabaceae (28 species, or 21%), Convolvulaceae (17 species, or 13%), Cucurbitaceae (12 species, or 9%) and Apocynaceae (9 species, or 7%).

Table 1. List of conservation status lianas introduced in Côte d'Ivoire.

Taxa	Synonymous	Famille	UICN (2024)	Zones d'endémisme
1. *Allamanda violacea* Gardn.	-	Apocynaceae	-	Brazil
2. *Bougainvillea glabra* Choisy	-	Nyctaginaceae	-	Brazil
3. *Bougainvillea spectabilis* Willd.	-	Nyctaginaceae	-	Brazil
4. *Cryptostegia grandiflora* (Roxb.) R.Br.	-	Apocynaceae	-	Madagascar
5. *Epipremnum aureum* (Linden & André) G.S.Bunting	*Scindapsus aureus* (Linden & André) Engl.	Araceae	-	Society Island
6. *Piper nigrum* L.	-	Piperaceae	-	India
7. *Rosa chinensis* Jacq.	-	Rosaceae	-	China
8. *Rubus pinnatus* Willd.	*Rubus pinnatus* var. *afrotropicus* (Engl.) Gust.	Rosaceae	-	South Africa (Cape Provinces)
9. *Thunbergia atacorensis* Akoègn. & Lisowski	-	Acanthaceae	-	Benin
10. *Uvaria dinklagei* Engl. & Diels	-	Annonaceae	-	Liberia
11. *Vanilla planifolia* Jacks. ex Andrews	-	Orchidaceae	EN	-

Legend: IUCN Red List: EN= Endangered.

Biological types, Subphylum, Cotyledon type, Living Environment, Longevity and Morphological type

Regarding the biological types (Fig. 3.), microphanerophytes are predominant with 108 species or 79%. They are followed by the nanophanerophytes with 26 species or 19%. The mesophanerophytes are represented only by 2 species or 2%. Concerning subphylum, cotyledon type and habitat, all introduced lianas (100%) are terrestrial dicotyledon angiosperms (Fig. 4.). Regarding longevity, 112 introduced lianas are perennial or 82% while 24 lianas or 18% are annual. Finally, in terms the morphological type, the introduced lianas contain 73 herbaceous plants or 54% against 63 woody plants or 46%.

Conservation status of lianas introduced

There were 11 lianas introduced with conservation status (Table 1.). Ten (10) species are endemic to 8 countries: South Africa, Benin, Brazil, China, India, Liberia, Madagascar and the Society Island. One species is on the IUCN red list (2024), *Vanilla planifoliaJ* acks. ex Andrews (Orchidaceae) is an endangered species (EN).

Origin

Regarding the origin of the species (Fig. 5. and 6.), the majority (35%) of the introduced lianas come from America, precisely from South America (65%). They are followed by Asia with 30% being precisely South Asia (46%) and Southeast (35%).

Table 2. List of some liana species introduced in Côte d'Ivoire with their potential uses.

Taxa	Parts used	Uses	Taxa	Parts used	Uses
01. *Allamanda cathartica*	Whole plant	Ornamental	67. *Merremia cissoides*	Leaves/Roots	Medicinal
	Roots/barks/Leaves	Medicinal	68. *Merremia tuberosa*	Whole plant	Ornemental
02. *Allamanda violacea*	Whole plant	Ornemental	69. *Mesosphaerum pectinatum*	Leaves	Food
03. *Antigonon leptopus*	Whole plant	Ornemental		Whole plant	Ornemental
	Leaves	Medicinal		Leaves	Medicinal
	Stems	Artisanal	70. *Mikania scandens*	Whole plant	Ornemental
04. *Argyreia nervosa*	Seeds/roots	Medicinal	71. *Mikaniopsis tedliei*	Whole plant	Ornemental
	Leaves	Ornemental	72. *Mimosa candollei*	Flowers/Leaves	Ornemental
05. *Aristolochia elegans*	Whole plant	Ornemental	73. *Mimosa invisa*	Leaves	Forage
06. *Aristolochia odoratissima*	Whole plant	Ornemental	74. *Mimosa pudica*	Roots/Leaves	Medicinal
07. *Aristolochia ringens*	Whole plant	Ornemental	75. *Mimosa scabrella*	Roots/Leaves	Medicinal
08. *Aristolochia trilabiata*	Whole plant	Ornemental	76. *Neuropeltis velutina*	Whole plant	Ornemental
09. *Asparagus setaceus*	Leaves	Ornemental	77. *Passiflora coccinea*	Flowers	Ornemental
10. *Asystasia gangetica*	Leaves	Medicinal		Leaves	Medicinal
	Flowers	Ornemental	78. *Passiflora edulis*	Fruit	Food
11. *Baissea welwitschii*	Roots/leaves/stems	Medicinal		Leaves/Stems	Medicinal
12. *Basella alba*	Leaves	Food	79. *Passiflora foetida*	Fruit	Food
	Leaves/Stems	Medicinal		Leaves/Stems	Medicinal
13. *Biancaea decapetala*	Whole plant	Ornemental	80. *Passiflora laurifolia*	Fruit	Food
14. *Bignonia aequinoctialis*	Whole plant	Ornemental	81. *Petrea volubilis*	Whole plant	Ornemental
15. *Bougainvillea glabra*	Whole plant	Ornemental		Leaves	Medicinal
16. *Bougainvillea spectabilis*	Whole plant	Ornemental	82. *Phaseolus calcaratus*	Seeds	Food
17. *Cajanus scarabaeoides*	Seeds	Food		Seeds	Medicinal
	Leaves	Medicinal	83. *Phaseolus lunatus*	Seeds	Food
	Leaves/stems	Forage	84. *Phaseolus vulgaris*	Young shoots/Seeds	Food
18. *Calopogonium mucunoides*	Leaves/stems	Forage	85. *Philodendron ×domesticum*	Whole plant	Ornemental
19. *Campsis radicans*	Roots/Leaves	Medicinal	86. *Philodendron bipinnatifidum*	Whole plant	Ornemental
20. *Canavalia ensiformis*	Seeds	Food		Leaves	Medicinal
21. *Centrosema plumieri*	Flowers/Leaves	Ornemental	87. *Piper arboreum*	Leaves	Ornemental
22. *Centrosema pubescens*	Leaves/Stems	Forage		Leaves	Medicinal
	Flowers	Ornemental		Leaves/Fruit	Perfumery
23. *Ceropegia paricyma*	Roots/Leaves/Stems	Medicinal	88. *Piper nigrum*	Fruit	Food
24. *Clerodendrum thomsonae*	Flowers/Leaves	Ornemental	89. *Piper peltatum*	Leaves	Food
25. *Clitoria ternatea*	Flowers	Food		Leaves/Roots	Medicinal
26. *Combretum indicum*	Whole plant	Ornemental		Leaves	Insecticide
	Leaves	Medicinal	90. *Plumbago auriculata*	Roots/Leaves	Medicinal
27. *Cryptolepis calophylla*	Roots/Stems/Leaves	Medicinal		Whole plant	Ornemental
28. *Cryptostegia grandiflora*	Flowers	Ornemental	91. *Podranea ricasoliana*	Whole plant	Ornemental
	Whole plant	Green manure		Leaves/Flowers	Medicinal
29. *Cucumis anguria*	Fruit	Food	92. *Pueraria phaseoloides*	Leaves	Forage
	Leaves/Fruit	Medicinal	93. *Pueraria phaseoloides* var. *javanica*	Whole plant	Green manure
30. *Cucumis hirsutus*	Fruits/Seeds/Leaves/Roots	Medicinal		Roots	Medicinal
31. *Cucumis melo*	Fruit	Food	94. *Pyrostegia venusta*	Whole plant	Ornemental
32. *Cucumis sativus*	Fruit	Food		Leaves/Flowers	Medicinal
	Fruit	Medicinal	95. *Rhynchosia resinosa*	Whole plant	Green manure
33. *Cucurbita maxima*	Fruit	Food	96. *Rosa canina*	Fruit	Food
34. *Cucurbita pepo*	Fruit	Food		Roots/Leaves/Flowers	Medicinal
35. *Cyphostemma serpens*	Leaves/Stems	Medicinal		Seeds	Cosmetic
	Whole plant	Ornemental		Flowers/fruit	Tincture
36. *Derris elliptica*	Roots	Medicinal		Whole plant	Ornemental
	Roots	Insecticide		Flowers	Food

37. *Dioscorea alata*	Roots	Food		Flowers	Medicinal
38. *Dioscorea esculenta*	Roots	Food	97. *Rosa chinensis*	Whole plant	Ornemental
39. *Epipremnum aureum*	Whole plant	Ornemental	98. *Rubus pinnatus*	Fruit	Food
40. *Epipremnum pinnatum*	Whole plant	Ornemental	99. *Secamone brevipes*	Roots	Medicinal
41. *Eremospatha hookeri*	Stems	Artisanal		Whole plant	Ornemental
42. *Ficus pumila*	Whole plant	Ornemental	100. *Sechium edule*	Fruit/Leaves	Food
43. *Fragaria vesca*	Fruit	Food		Roots/Leaves	Medicinal
44. *Glycine javanica*	Leaves/Stems	Forage	101. *Syngonium podophyllum*	Whole plant	Ornemental
45. *Gonolobus rostratus*	Whole plant	Ornemental		Leaves	Medicinal
46. *Hylocereus triangularis*	Fruit	Food	102. *Thecacoris stenopetala*	Leaves	Medicinal
47. *Ipomoea alba*	Whole plant	Ornemental	103. *Thunbergia atacorensis*	Flowers/Leaves	Ornemental
	Leaves/Roots	Medicinal	104. *Thunbergia grandiflora*	Roots/Leaves	Medicinal
48. *Ipomoea batatas*	Roots/Leaves	Food		Flowers	Ornemental
49. *Ipomoea bonariensis*	Whole plant	Ornemental	105. *Thunbergia laurifolia*	Leaves	Medicinal
50. *Ipomoea carnea*	Whole plant	Ornemental		Flowers/Leaves	Ornemental
	Leaves/roots/seeds	Medicinal	106. *Trichosanthes cucumerina*	Fruit	Food
51. *Ipomoea pileata*	Whole plant	Ornemental		Leaves/Fruit/Roots/Seeds	Medicinal
52. *Ipomoea purpurea*	Whole plant	Ornemental	107. *Tristellateia australasiae*	Whole plant	Ornemental
	Seeds	Medicinal		Leaves/Flowers	Medicinal
53. *Ipomoea quamoclit*	Whole plant	Ornemental	108. *Uvaria dinklagei*	Fruit	Food
54. *Ipomoea setifera*	Whole plant	Ornemental		Roots/Leaves	Medicinal
55. *Ipomoea tricolor*	Flowers	Ornemental		Roots/bark/leaves	Medicinal
56. *Jasminum grandiflorum*	Whole plant	Ornemental		Fruit	Food
	Flowers/Leaves	Medicinal	109. *Uvaria heterotricha*	Bark/Fruit	Tincture
	Whole plant	Ornemental		Fruit	Food
57. *Jasminum multiflorum*	Flowers/Leaves	Medicinal		Fruit	Medicinal
	Flowers/Leaves	Parfumerie	110. *Vanilla planifolia*	Fruit	Perfumery
58. *Jasminum nobile*	Whole plant	Ornemental		Whole plant	Ornemental
	Flowers	Perfumery	111. *Vigna heterophylla*	Seeds/Young shoots	Food
59. *Jasminum officinale*	Whole plant	Ornemental		Leaves/Stems	Forage
	Flowers	Parfumerie		Leaves/Seeds	Medicinal
60. *Lantana camara*	Flowers	Ornemental	112. *Vigna juruana*	Seeds/Young shoots	Food
	Leaves	Medicinal		Leaves/Stems	Forage
61. *Lathyrus oleraceus*	Seeds	Food		Leaves/Seeds	Medicinal
62. *Lonicera japonica*	Whole plant	Ornemental	113. *Vitis vinifera*	Fruit	Food
	Flowers/Leaves	Medicinal		Fruit	Medicinal
63. *Luffa acutangula*	Fruit	Food		Whole plant	Ornemental
64. *Luffa aegyptiaca*	Fruit	Food/ Artisanal	114. *Volkameria aculeata*	Leaves/Flowers	Ornemental
65. *Macroptilium atropurpureum*	Seeds	Food		Stems	Artisanal
	Whole plant	Ornemental	115. *Volkameria inermis*	Leaves/Flowers	Ornemental
	Leaves/Stems	Forage		Stems	Artisanal
66. *Melothria sphaerocarpa*	Fruit/Leaves	Food	116. *Zehneria thwaitesii*	Fruit	Food
	Whole plant	Ornemental		Leaves/stems	Medicinal
	Leaves	Medicinal		Whole plant	Ornemental

Plants from Africa follow with 25%. The majority of these are from Central Africa (36%) and West Africa (33%). Finally, plants from Oceania come with 8% and Europe with 2%.

Potential uses of lianas introduced

One hundred and sixteen (116) introduced lianas or 85% were identified as having a use by the populations (Table 2). Ten (10) categories of use for the lianas introduced were identified (Fig. 7.). These are food, crafts, traditional medicine, ornamentation, forage, green manure, insecticide, perfumery, dyeing and cosmetics. Sixty-seven (67) lianas or 49% of all species have an ornamental use. Fifty-seven (57) lianes or 42% have a medicinal use and 40 lianas or 29% have a food use.

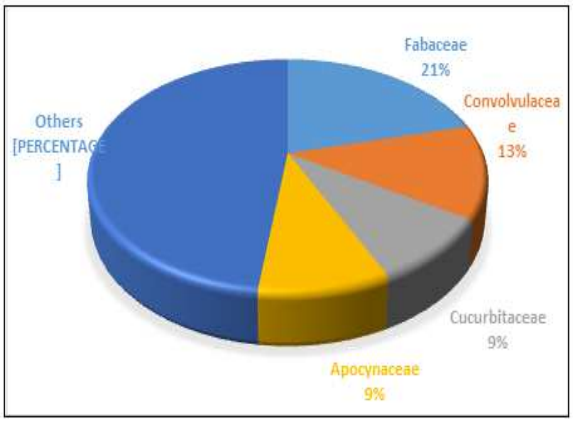


Fig 2. Spectrum of dominant botanical families of lianas introduced to Côte d'Ivoire.

Ornamentation (49%), traditional medicine (42%) and food (29%) are the main uses of lianas by the population. Next come forage (7%), perfumery (4%), craft (3%), green manure (2%) and cosmetics, insecticide and tincture with respectively 1%.

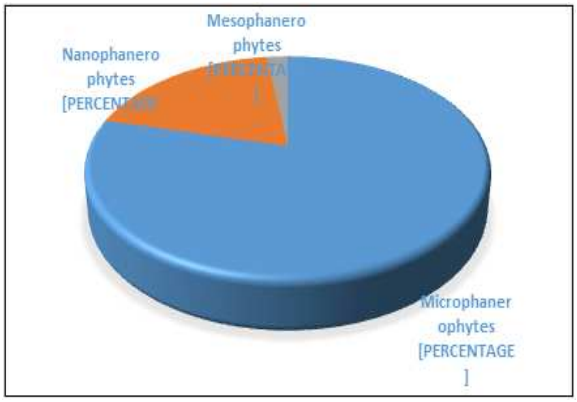


Fig. 3. Spectrum of biological types of lianas introduced to Côte d'Ivoire.

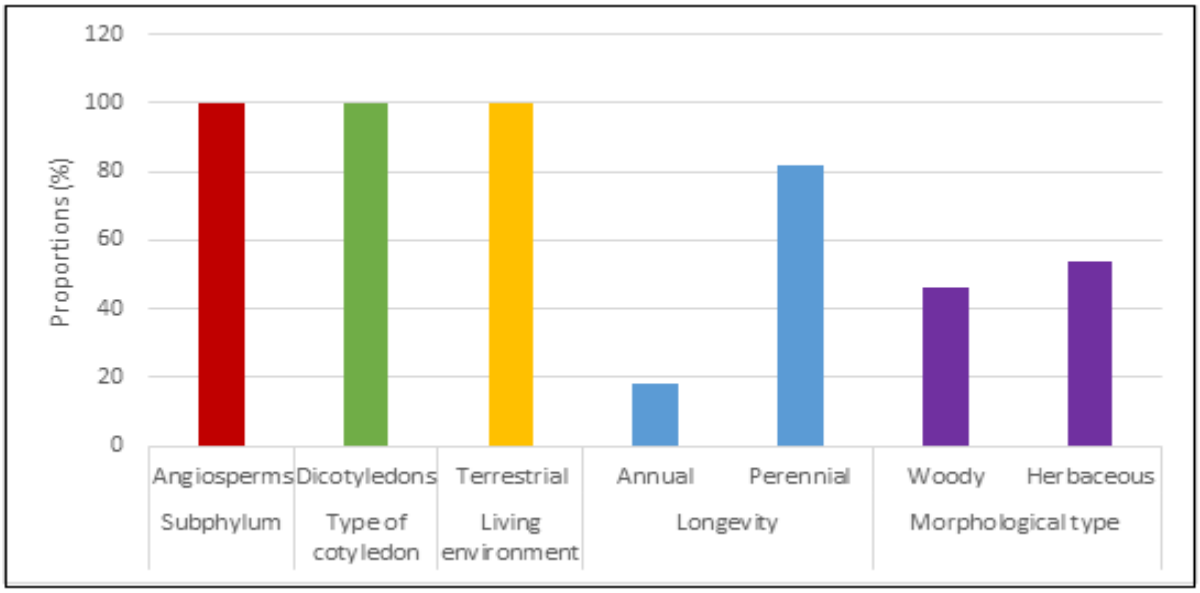


Fig 4. Histogram of the Subphylum, type of cotyledon, living environment, longevity and morphological type of lianas introduced from Côte d'Ivoire.

Organs used of lianas

Seven (07) types of lianas organs are collected from populations for the main uses (Fig. 8.). The whole plant, leaves and flowers are used in ornamentation. The leaves, roots, bark, seeds, flowers, fruits and stems are used in traditional medicine. However, the leaves (49%) and roots (23%) are the organs most used in traditional medicine. The main organs used in food are fruits, seeds, leaves, roots and flowers. However, fruits (49%), seeds (20%) and leaves (20%) are the organs most used in the diet. Leaves and stems (78%) are the main organs most used for fodder. Flowers, leaves and fruits are the organs used in perfumery. The stems are the main organs used in artisanal production and the whole plant is used as green manure. Finally, the seeds are used in cosmetics, the leaves and roots for insecticide and the flowers, fruits and bark of lianas are used for dyeing.

Discussion

In this study, a total of 136 species of introduced lianas belonging to 85 genera and divided into 36 families were identified. This value represents 3% of the indigenous or autochthonous Ivorian flora which

has been estimated at 3882 species divided into 1218 genera and 192 families (Aké-Assi, 1984; 2001; 2002). Our results are superior to those of Koffi *et al.* (2016) who identified 63 species of lianas divided into 47 genera and 28 families in the Azagny National Park located in the south of Côte d'Ivoire.

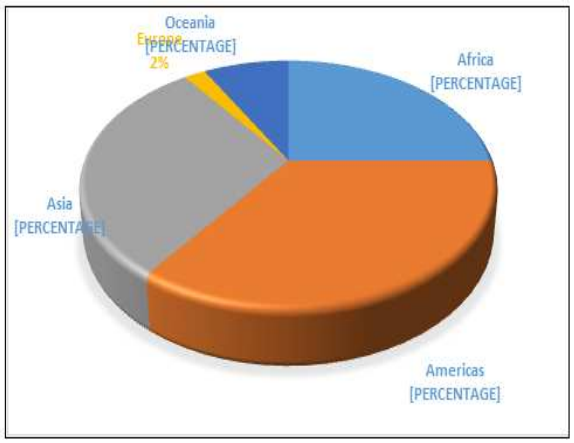
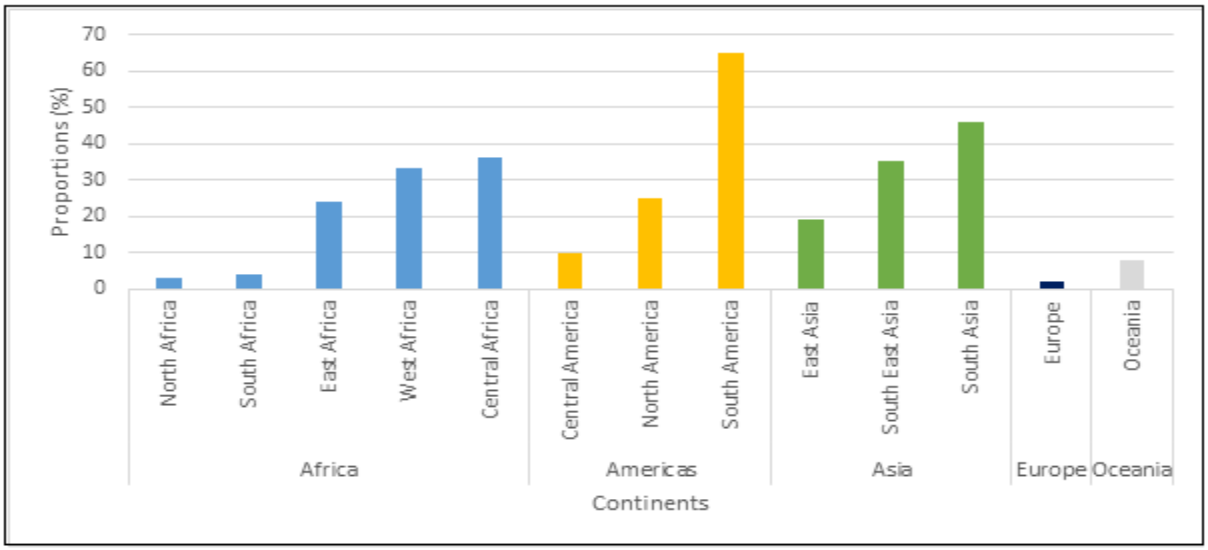


Fig. 5. Spectrum of origin of the lianas introduced from Côte d'Ivoire.

The dominant genera are: *Ipomoea*, *Merremia*, *Mimosa* and *Passiflora*. The most predominant families are: Fabaceae, Convolvulaceae, Cucurbitaceae and Apocynaceae. When considering biological types, introduced lianas are dominated by microphanerophytes (79%).

This study showed that the introduced lianas came from 2 continents (Americas and Asia). However, species from South America, Southeast Asia and south predominate. Our results are similar to those of Ansong *et al.* (2019). This author demonstrated that most of Ghana's exotic species came from the Americas and Asia. The introduced Ivorian lianas are all terrestrial dicotyledonous angiosperms.

They are mostly perennial (82%). Lianas are dominated by herbaceous plants (54%) compared to 46% of woody plants.



Fig, 6. Histogram of the origin of the lianas introduced from Côte d'Ivoire according to continents.

The reasons are most likely the competitive advantage of herbaceous plants over woodlands (Jelbert *et al.*, 2015; Moravcová *et al.*, 2015). Eleven (11) species with conservation status have been identified, including 10 species endemic to their country of origin and one species present on the IUCN red list (2024), *Vanilla planifolia* Jacks. ex Andrews (Orchidaceae). It is an endangered species (EN). One hundred and sixteen (116) lianas introduced, or 85%, were identified as being used by the populations. Unlike the present study, Koffi *et al.* (2021) identified 43 species of lianas used by local populations in Azagny National Park located in the south of Côte d'Ivoire. However, our results are substantially equal to those of Tra Bi *et al.* (2005) who identified 114 species of lianas used by local populations in the classified forests of Scio and Haut-Sassandra in western Côte d'Ivoire. Ornamentation (49%) is the main use made of introduced lianas. According to Halford and Mahy (2013), horticulture is considered

one of the main vectors for the introduction of invasive plants. Indeed, most invasive plants are ornamental plants. Initially introduced by humans for horticultural uses in botanical gardens, nurseries, parks and gardens, they unfortunately escaped and colonized natural environments.

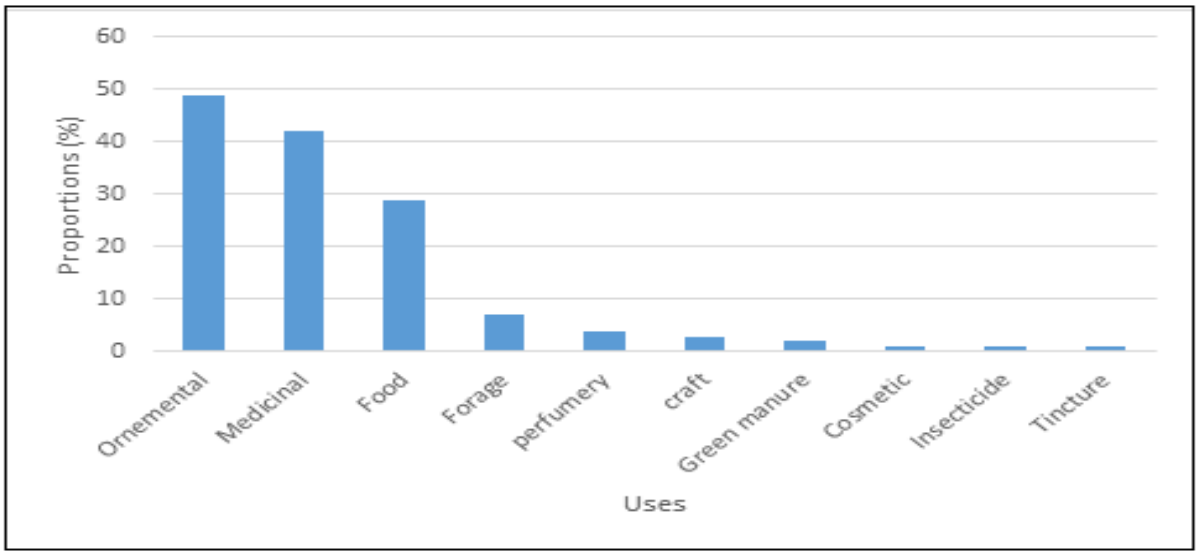


Fig. 7. Main uses of lianas introduced,

Traditional medicine (42%) and food (40%) are the second uses made of lianas by populations. Koffi *et al.* (2021) have also demonstrated in their work that food and traditional medicine are the main uses made by populations, as is the case in several forests. Eilu and Bukenya-Zirabab (2004) reported that lianas are mainly used as a medicinal plant, then as building materials and, finally, as food, by people living near the Budongo reserve in Uganda.

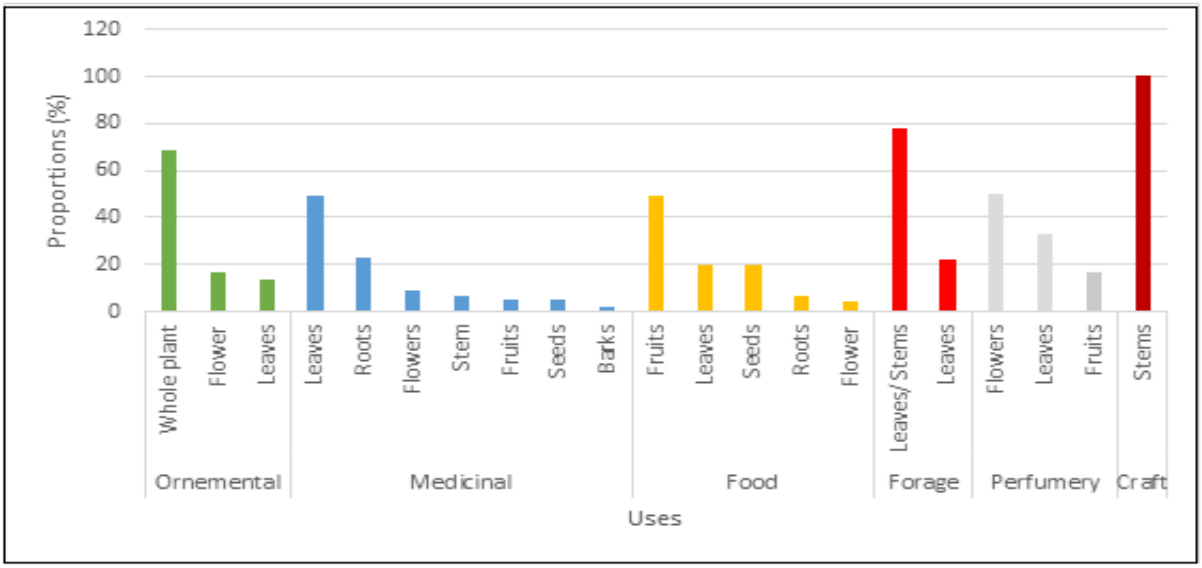


Fig. 8. Histogram of the main uses of lianas introduced and the organs used by populations.

All plant organs (leaves, roots, bark, seeds, flowers, fruits and stems) are used in traditional medicine. But the most sought-after organs remain the leaves. Tra Bi *et al.* (2002) found the same results. Generally speaking, fruits, seeds and leaves are the most consumed organs of introduced lianas. Our results are similar to those of Kouamé and Gnahoua (2008). These authors showed that Gagnoa populations

mainly consume fruits (seeds, cotyledons and almonds) and liana leaves.

Conclusion

At the end of this study, we can note that Côte d'Ivoire is rich in 136 species of lianas introduced belonging to 85 genera and divided into 36 families. The dominant genera are: *Ipomoea*, *Merremia*, *Mimosa* and *Passiflora*. The most predominant families are: Fabaceae, Convolvulaceae, Cucurbitaceae and Apocynaceae. The introduced lianas are dominated by microphanerophytes (79%). They come from 2 continents (Americas and Asia). The introduced Ivorian lianas are all terrestrial dicotyledonous angiosperms. They are mostly perennial (82%). They are dominated by herbaceous plants (54%) compared to 46% of woody plants. Eleven (11) species with special status have been identified, including 10 endemic species and one species present on the IUCN red list, *Vanilla planifolia* (Orchidaceae). It is an endangered species (EN). One hundred and sixteen (116) introduced lianas, or 85%, were identified as being of interest to populations. The main uses made of lianas by the Ivorian populations are ornamentation (49%), traditional medicine (42%) and food (29%). All the organs of the lianas are taken by the populations for the main uses. These are leaves, roots, bark, seeds, flowers, fruits and stems. Thus, introduced lianas play an important role in the care of Ivorian populations.

Acknowledgements

We thank the Félix Houphouët-Boigny University and the Center National de Floristique (CNF) for their support in the writing of this article. We also thank all our colleagues, who through their contribution have made it possible to improve the results of this work.

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