

Diversity and origin of medicinal exotic flora in Cape Verde Islands

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Background and aims – The Cape Verde Islands were discovered by Portuguese navigators who, throughout the 15th century, explored the African coasts. Despite the recognised value of the Cape Verde flora, the study of medicinal plants is still incipient. The main goal of the present study was to understand the ancestral uses of the exotic medicinal flora that the population of the archipelago still uses, allowing some considerations for the geographic origin of these species.

Methods – This study is mostly based on the collection of ethnobotanical data obtained in specimens housed in LISC Herbarium and in available botanical and historical bibliographic data.

Key results – A checklist of the exotic medicinal plants of Cape Verde is presented. The use of local flora in folk medicine is common, and 101 exotic naturalized taxa were reported as medicinal in this archipelago. Most of these plants arise from Afrotropical, Neotropical, Palearctic, or Pantropical regions. Furthermore nineteen non-naturalized exotic taxa, mainly from Neotropical and Oriental regions, were reported as medicinal.

Conclusions – This study shows the relevance of historical factors in the determining the composition of the medicinal flora in Cape Verde, namely the importance that the slave trade routes from Africa to the Americas played during the period of the 16th–19th centuries. It also allows the recognition and positive valuation of the cultural and biological Cape Verde's patrimony and its sustainable use.

Key words – West Africa, medicinal plants, non-indigenous flora, species distribution, history of plant use, traditional medicine.

INTRODUCTION

The Cape Verde archipelago is located in the North Atlantic Ocean, in close proximity to the western African coast, c. 600 km west of Senegal. All the nine inhabited islands are of volcanic origin, namely: Santo Antão, São Vicente, São Nicolau (Northern Islands), Santiago, Fogo, Brava (Southern Islands), and Sal, Boavista and Maio (Eastern Islands) (fig. 1). This archipelago was discovered by Portuguese navigators who, throughout the 15th century, explored the African coast (Albuquerque 1991). Documents relating to its discovery do not record the existence of any traces of human occupation, but mention the existence of several plant species that attracted the attention of their first occupants (Cardoso 1902). The colonization of Cape Verde, which began around 1460 in Santiago Island, was laid by Europeans, mainly Portuguese but also some Spanish, a few Italians, and Africans purchased on the West African coast, especially on the Guinea coast (slave trade) (Ribeiro 1955). The geographical position of Cape Verde in the Atlantic Ocean transformed these islands into an important port of call for the supply and repair of the Portuguese vessels (Carreira 1986). In the main port city of

Santiago Island, Ribeira Grande, sailors from Portugal, traders on their way to Central America or Brazil, and travellers returning from the East, exchanged experiences and knowledge and left some plants brought from distant locations that served to prevent and cure most illnesses (Torrão & Soares 2009).

Although the introduction of many plants in Cape Verde seems to have been intentional, the availability of old descriptions of the plant uses in these islands is scarce (Duarte & Moreira 2002). In general, the lack of registered thorough sampling until the middle of the 19th century was a result of the fact that botanists visiting this archipelago were only taking advantage of their short stops on the way to more botanically rich regions for collection and study of the local flora (Pettersson 1960). In fact, it was only in the 19th century that these islands began to raise the interest among the naturalists and scientists, and some field expeditions were made by Forbes in 1822, Darwin in 1832, Hooker in 1839, Bolle in 1851, and Welwitsch in 1853 and 1861 (Barbosa 1961). In the 19th and 20th centuries several important works were published (e.g. Webb 1849, Schmidt 1852, Chevalier 1935,

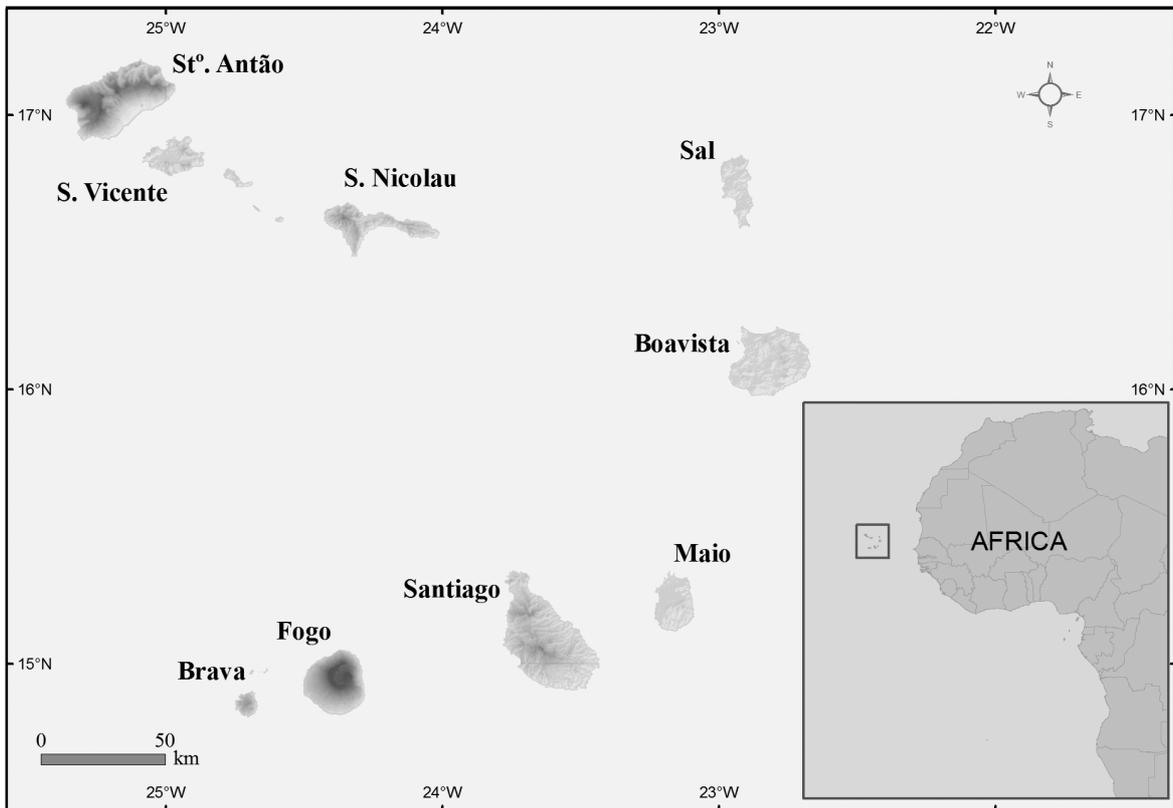


Figure 1 – Geographic location of Cape Verde archipelago in the North Atlantic Ocean.

Hansen & Sunding 1993, Brochmann et al. 1997, Paiva et al. 1995–1996, Martins et al. 2002) providing a reasonable insight into the knowledge of the Cape Verde flora. Despite these and other botanical studies, several important issues remain to be considered, namely related to the collection of ethnobotanical data. The few studies available concerning the uses of medicinal plants in this archipelago (namely Barbosa 1961, Gomes et al. 1995, Varela 1999, 2001, and Vera-Cruz 1999) are written in Portuguese, which increases the difficulty for the scientific community to access the information.

Despite the subtropical dry climate that characterizes this archipelago, and which has not allowed the development of abundant vegetation, the Cape Verde flora comprises about 740 spontaneous or naturalized taxa from more than one hundred families, the Asteraceae, Euphorbiaceae, Fabaceae, Malvaceae, Solanaceae, Cyperaceae, and Poaceae being the most well-represented (Duarte et al. 2008). Most of the archipelago's flora is presently composed of exotic naturalized species (Duarte & Romeiras 2009).

Since the Cape Verde Islands were not inhabited up to the end of the 15th century (Cardoso 1902), it will be helpful to understand how the introduction of plants for medicinal purposes, constituted a factor in defining the present day flora. As such, herein is presented a study that has been developing in the field of characterization of the Cape Verde exotic medicinal flora, in order to understand the traditional use of the exotic medicinal flora that the population of this archipelago still uses and to highlight some features related to their introduction during islands colonization.

MATERIAL AND METHODS

Data was gathered from published research papers on medicinal plant studies in Cape Verde (Barbosa 1961, Gomes et al. 1995, Vera-Cruz 1999, Varela 1999, 2001) and complemented by exhaustive consultation of specimens kept in LISC Herbarium (IICT/Tropical Research Institute), which holds the most important collection of Cape Verde flora. For each taxon, the family, scientific and local name, habit and distribution in Cape Verde (only inhabited islands) and worldwide native range were included in a database. This data was gathered in Chevalier (1935), Brochmann & Rustan (1981), *Flora de Cabo Verde* (Paiva et al. 1995–1996, Martins et al. 2002), *Flore du Sénégal* (Berhaut 1971, 1974, 1975a, 1975b, 1976, 1979, Vanden Berghen 1988, 1991), *Flora of West Tropical Africa* (Hepper 1963, 1968–1972, Hutchinson & Dalziel 1954–1958), Hansen & Sunding (1993), and Sánchez-Pinto et al. (2005) as well as in several published papers related with particular taxa. Also data collected in recent field work done by the authors was taken into consideration. Data concerning the origin (native vs. introduced) of the species was mainly obtained from Lobin & Zizka (1987), Ferrão (1993) and Sánchez-Pinto et al. (2005). However with some taxa it was not possible to obtain accurate data since their geographic origin is unknown or doubtful.

The scientific names were revised and updated using online databases such as Tropicos (<http://www.tropicos.org>).

For the exotic plants used in traditional medicine in Cape Verde, the data was organized in two categories: (a) the naturalized species, i.e. the introduced plants that have shown the

Table 1 – Checklist of the exotic naturalized medicinal plants of Cape Verde Islands.

(a), the taxa in which the introduced status in Cape Verde is somewhat doubtful are marked with an asterisk (*), (b), in the case of recent nomenclatural changes, synonyms commonly employed in Cape Verdean botanical literature are included; (c), the terminology used follows Morrone (2002). Whenever possible, the distribution of each taxon concerns to its native geographic range; (d), Cape Verde Islands abbreviations: A, Santo Antão; V, São Vicente; N, São Nicolau; S, Sal; B, Boavista; M, Maio; T, Santiago; F, Fogo; and Br, Brava.

family scientific name ^{(a) (b)}	local name	native distribution ^(c)	habit	distribution in Cape Verde ^(d)
DICOTYLEDONEAE				
Amaranthaceae				
<i>Achyranthes aspera</i> L. var. <i>sicula</i> L.	malpica	Afrotropical	perennial herb	A, V, N, M, T, F, Br
* <i>Aerva javanica</i> (Burm.f.) Juss.		Afrotropical	perennial herb	A, V, N, S, B, M, T, F, Br
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	mo-na-pé	Afrotropical	annual or perennial herb	A, V, T
<i>Amaranthus hybridus</i> L. subsp. <i>hybridus</i>	bre-do-macho	Oriental	annual herb	A, T
<i>Amaranthus spinosus</i> L.	bre-do-espinhoso	Neotropical	annual herb	A, V, N, B, M, T, F, Br
<i>Amaranthus viridis</i> L.	bre-do	Afrotropical	annual herb	V, T
<i>Celosia trigyna</i> L.		Afrotropical	annual herb	A, T
<i>Gomphrena globosa</i> L.		Oriental	annual herb	N, T
Apiaceae				
<i>Anethum graveolens</i> L.	endre, ente, endro, erva-doce	Palaeartic	annual herb	N, B, T, F, Br
<i>Foeniculum vulgare</i> Mill.	erva doce, funcho	Palaeartic	perennial herb	A, V, N, T, F, Br
Apocynaceae				
<i>Nerium oleander</i> L.	loendro, cevadinha	Palaeartic	shrub	A, V, N, S, B, M, T, F
Asclepiadaceae				
* <i>Calotropis procera</i> (Aiton) W.T.Aiton	bombardeiro	Afrotropical- Oriental	shrub	A, V, N, S, B, M, T, F, Br
Asteraceae				
<i>Acanthospermum hispidum</i> DC.	carrapiça, espinho-de- cigano	Neotropical	annual herb	A, V, N, S, M, T, F, Br
<i>Ageratum conyzoides</i> L.	oregão, matinho-de- lisboa	Pantropical	annual herb	A, V, N, S, T, F, Br
<i>Blainvillea gayana</i> Cass.		Afrotropical	annual herb	A, V, N, M, T, F, Br
<i>Centaurea melitensis</i> L.	unha-de-gato-bastarda	Palaeartic	annual or biennial herb	A, N, T, Br
<i>Cichorium intybus</i> L.	chicoria	Palaeartic	perennial herb	A
* <i>Crassocephalum rubens</i> (Juss. ex Jacq.) S.Moore		Afrotropical	annual herb	N, F, Br
<i>Eclipta prostrata</i> (L.) L. (= <i>Eclipta alba</i> (L.) Hassk.)		Afrotropical- Neotropical	annual herb	T, Br
<i>Sclerocarpus africanus</i> Jacq. ex Murray		Afrotropical- Oriental	annual herb	M, T, F
<i>Sonchus oleraceus</i> L.	serralha, algodão-de- garça	Palaeartic	annual or biennial herb	A, V, N, S, M, T, F, Br
<i>Synedrella nodiflora</i> (L.) Gaertn.		Neotropical	annual herb	A, N, T, F, Br
<i>Vernonia cinerea</i> (L.) Less.		Afrotropical	annual or biennial herb	A, V, N, T, F
<i>Vernonia colorata</i> (Willd.) Drake		Afrotropical	shrub	N, F
Boraginaceae				
* <i>Heliotropium crispum</i> Desf.	alfavaca, três marias, furtaragem	Afrotropical- Palaeartic	perennial herb	A, V, N, S, B, M, T, F, Br

Table 1 (continued) – Checklist of the exotic naturalized medicinal plants of Cape Verde Islands.

family scientific name ^{(a)(b)}	local name	native distribution ^(c)	habit	distribution in Cape Verde ^(d)
DICOTYLEDONEAE				
Boraginaceae				
<i>*Heliotropium pterocarpum</i> (DC. & A.DC.) Hochst. & Steud. ex Bunge.	alfavaca, mama-bitcho	Afrotropical	perennial herb	A, V, N, B, M, T
Brassicaceae				
<i>Brassica nigra</i> (L.) W.D.J.Koch	mostarda-preta	Palaeartic	annual herb	A, V, N, T, Br
<i>Nasturtium officinale</i> R.Br.	agrião	Cosmopolitan	perennial herb	A, V, N, T, F, Br
Cactaceae				
<i>Opuntia ficus-indica</i> (L.) Mill.	tabaibo, figueira-do-inferno	Neotropical	shrub	A, N, T, F
Chenopodiaceae				
<i>Chenopodium ambrosioides</i> L.	fedegosa, cha-de-ribeira, palha-teixeira	Neotropical	annual herb	A, V, N, B, M, T, F, Br
<i>Chenopodium murale</i> L.	fedegosa, padja gosa	Palaeartic	annual herb	A, V, N, S, B, M, T, F, Br
Convolvulaceae				
<i>Ipomoea muricata</i> (L.) Jacq. (= <i>Ipomoea turbinata</i> Lag.)	calabaceira	Neotropical	annual or perennial herb	A, N, M, T, F
Cucurbitaceae				
<i>Momordica charantia</i> L.	banana-rato, sacaitano, aboborinha são caetano	Pantropical	perennial herb	A, V, N, B, M, T, F, Br
Euphorbiaceae				
<i>Jatropha curcas</i> L.	purga, purgueira	Neotropical	shrub or small tree	A, V, N, S, B, M, T, F, Br
<i>Ricinus communis</i> L.	bafareira, djaqui, ricino	Afrotropical	annual or perennial herb	A, V, N, M, T, F, Br
Lamiaceae				
<i>*Ajuga iva</i> (L.) Schreb. var. <i>pseudoiva</i> (Labill. & Castagne ex DC.) Steud.	piorrinho, mata-piolho	Palaeartic	perennial herb	A, V, N, S, T
<i>*Lavandula coronopifolia</i> Poir. var. <i>coronopifolia</i>	risco	Afrotropical-Palaeartic	perennial herb	A, V, N, S, T, Br
<i>*Lavandula dentata</i> L.	rosmaninho	Palaeartic	shrub	A, F, Br
<i>Leucas martinicensis</i> (Jacq.) R.Br.	morroio	Afrotropical	annual herb	A, V, N, M, T, F, Br
<i>Ocimum basilicum</i> L.	magericão	Palaeartic	perennial herb	A, N, T, F
<i>Rosmarinus officinalis</i> L.	alecrim	Palaeartic	shrub	A, F
Leguminosae (s. lat.)				
Caesalpinjiaceae				
<i>*Chamaecrista absus</i> (L.) H.S.Irwin & Barneby		Afrotropical-Oriental	annual herb	A
<i>*Chamaecrista nigricans</i> (Vahl) Greene (= <i>Cassia nigricans</i> Vahl)	tintêro	Afrotropical-Oriental	annual herb	N, F
<i>*Senna italica</i> Mill. (= <i>Cassia italica</i> (Mill.) Lam. ex F.W.Andrews)	céni, senna, seno	Afrotropical	perennial herb	A, V, N, S, B, M, T, F
<i>Senna occidentalis</i> (L.) Link	baginha, pintchera	Neotropical	annual or perennial herb	A, V, N, S, B, M, T, F, Br
<i>Tamarindus indica</i> L.	tamarindo, tambarina	Afrotropical-Oriental	tree	A, V, N, S, M, T, F, Br

Table 1 (continued) – Checklist of the exotic naturalized medicinal plants of Cape Verde Islands.

family scientific name ^{(a)(b)}	local name	native distribution ^(c)	habit	distribution in Cape Verde ^(d)
DICOTYLEDONEAE				
Fabaceae				
* <i>Abrus precatorius</i> subsp. <i>africanus</i> Verdc.	santa-clara	Pantropical	perennial herb	A, N, T, F, Br
<i>Cajanus cajan</i> (L.) Huth	feijão-congo	Oriental	shrub	A, N, B, T, F, Br
<i>Clitoria ternatea</i> L.	palha-lobes, bachinha- de-codorniz	Pantropical	perennial herb	A, N, B, M, T, Br
<i>Crotalaria retusa</i> L. var. <i>retusa</i>	beijinho, flor-de- lagartixa	Pantropical	perennial herb	A, N, B, T, F, Br
<i>Desmodium hirtum</i> Guill. & Perr.	maratchinga, marquinha	Afrotropical	perennial herb	A, M, F
<i>Indigofera hirsuta</i> L. var. <i>hirsuta</i>	banana-santcho	Afrotropical	annual herb	N, T, F
<i>Indigofera tinctoria</i> L.	tinta, tinteiro	Oriental	shrub	A, N, B, M, T, F, Br
<i>Lonchocarpus laxiflorus</i> Guill. & Perr.		Afrotropical	small tree	A, T
<i>Mucuna pruriens</i> (L.) DC.	nganhoma	Afrotropical- Oriental	annual herb	A, T
<i>Rhynchosia minima</i> (L.) DC.	feijoeiro-de-lagartixa	Pantropical	perennial herb	A, V, N, S, B, M, T, F, Br
<i>Sesbania grandiflora</i> (L.) Pers.	monduro	Oriental	shrub	T, F
<i>Stylosanthes fruticosa</i> (Retz.) Alston		Afrotropical	perennial herb	T, F
<i>Tephrosia purpurea</i> (L.) Pers. subsp. <i>leptostachya</i> (DC.) Brummitt		Afrotropical- Oriental	perennial herb	V, B, T, F
<i>Zornia glochidiata</i> Rchb. ex DC.		Afrotropical	annual herb	A, V, N, M, T, F
Mimosaceae				
<i>Leucaena leucocephala</i> (Lam.) de Wit	acacia, linhacho, leucena	Neotropical	shrub or small tree	A, V, N, S, B, T, F, Br
Malvaceae				
* <i>Abutilon pannosum</i> (G.Forst.) Schldl.	lolo-branco, malva	Afrotropical- Oriental	perennial herb	A, V, N, S, B, M, T, F, Br
<i>Gossypium barbadense</i> L.		Neotropical	shrub	A, N, T, F
<i>Gossypium hirsutum</i> L.	algodoeiro	Neotropical	subshrub	A, V, N, B, M, T, F, Br
<i>Hibiscus cannabinus</i> L.		Afrotropical- Oriental	annual herb	M, T
<i>Hibiscus surattensis</i> L.		Afrotropical- Oriental	perennial herb	F
<i>Lavatera cretica</i> L.	malva	Palaeartic	annual herb	A, V, T
<i>Malva parviflora</i> L.	malvinha, marbinha	Palaeartic	annual herb	A, V, N, B, M, T, F, Br
* <i>Sida acuta</i> Burm. f.	lolô	Pantropical	annual herb	A, N, B, M, T, F, Br
* <i>Sida alba</i> L.	lôlô-fino	Pantropical	perennial herb	A, V, N, S, B, M, T
* <i>Sida cordifolia</i> L.		Pantropical	perennial herb	A, N, B, T, F
* <i>Sida rhombifolia</i> L.	lolô, loulo-preto- grande	Pantropical	annual herb	A, V, N, M, T, F, Br
<i>Urena lobata</i> L.		Pantropical	perennial herb	T, F
Meliaceae				
<i>Melia azedarach</i> L.	intendente, tendente, viúva	Oriental- Australotropical	tree	A, V, N, S, B, T, F, Br

Table 1 (continued) – Checklist of the exotic naturalized medicinal plants of Cape Verde Islands.

family scientific name ^{(a)(b)}	local name	native distribution ^(c)	habit	distribution in Cape Verde ^(d)
DICOTYLEDONEAE				
Moringaceae				
<i>Moringa oleifera</i> Lam.	acácia-branco, moringa	Oriental	small tree	A, S, M, T, F
Papaveraceae				
<i>Argemone mexicana</i> L.	cardo, cardo-santo	Nearctic- Neotropical	annual herb	A, V, N, S, B, M, T, F, Br
Plantaginaceae				
<i>Plantago major</i> L.	fedegosa, tanchagem	Palaeartic	perennial herb	A, V, N, T, F, Br
Plumbaginaceae				
<i>Plumbago zeylanica</i> L.	fogo-da-serra, pega- cabrito	Pantropical	perennial herb	A, N, T, F, Br
Rubiaceae				
<i>Spermacoce verticillata</i> L. (= <i>Borreria verticillata</i> (L.) G.Mey.)	bedjo-teso, beio-teso	Afrotropical- Neotropical	subshrub	N, T, F, Br
<i>Mitracarpus hirtus</i> (L.) DC. (= <i>Mitracarpus scaber</i> Zucc. ex Schult. & Schult. f.)	beitece, beiteso, locotém	Pantropical	annual herb	B, F, Br
Rutaceae				
<i>Ruta chalepensis</i> L.	arruda	Palaeartic	subshrub	A, N, T
Sapindaceae				
<i>Sapindus saponaria</i> L.	sapodilha, aveleira, aveloa	Nearctic- Neotropical	shrub or small tree	A, T, F
Scrophulariaceae				
<i>Capraria biflora</i> L.		Neotropical	shrub	A, N
Solanaceae				
<i>Datura innoxia</i> Mill.	barbiaca-preta, barbidjaca	Neotropical	annual or perennial herb	A, V, N, B, M, T, F, Br
<i>Datura metel</i> L.	berbilhaca-roxa, berbilhaca	Neotropical	annual or perennial herb	A, N, F
<i>Datura stramonium</i> L.	berbilhaca, ervilhaca, estramónio	Nearctic	annual or biennial herb	A, N, S, B, M, T, F, Br
<i>Nicotiana glauca</i> Graham	chaluteiro, charroteira	Neotropical	annual or perennial herb	A, V, N, S, B, M, T, F, Br
<i>Physalis lagascae</i> Roem. & Schult.	malua	Neotropical	annual herb	T
<i>Solanum nigrum</i> L. subsp. <i>nigrum</i>	malagueta-de-galinha, sta-maria	Palaeartic- Oriental	annual or perennial herb	A, V, N, B, M, T, F, Br
* <i>Withania somnifera</i> (L.) Dunal	malagueta-de-galinha, pontadeira	Afrotropical- Oriental	perennial herb	A, V, N, B, T, F, Br
Verbenaceae				
<i>Lantana camara</i> L.	freira, kambara, lantana	Neotropical	shrub	A, V, N, B, T, F, Br
<i>Verbena officinalis</i> L.	agibon-da-terra, gibon	Palaeartic	annual or perennial herb	A, T, Br
MONOCOTYLEDONEAE				
Agavaceae				
<i>Agave sisalana</i> Perrine ex Engelm.	carapate-manila	Neotropical	shrub	A, V, N, T, F, Br
<i>Furcraea foetida</i> (L.) Haw.	carapate	Neotropical	shrub	A, V, N, T, F, Br
Asphodelaceae				
<i>Aloe vera</i> (L.) Burm. f.	babosa	Palaeartic	perennial herb	A, V, N, B, M, T, F, Br

Table 1 (continued) – Checklist of the exotic naturalized medicinal plants of Cape Verde Islands.

family scientific name ^{(a) (b)}	local name	native distribution ^(c)	habit	distribution in Cape Verde ^(d)
MONOCOTYLEDONEAE				
Commelinaceae				
<i>Commelina diffusa</i> Burm. f. subsp. <i>diffusa</i>	palha-de-água	Pantropical	annual herb	A, N, T
Cyperaceae				
* <i>Cyperus amabilis</i> Vahl		Pantropical	annual herb	F
<i>Cyperus esculentus</i> L.	vista	Pantropical	perennial herb	A, N, B, T, F
<i>Cyperus rotundus</i> L.	junca, injunça	Pantropical	perennial herb	A, V, N, M, T, F
* <i>Kyllinga pumila</i> Michx.		Afrotropical- Neotropical	annual herb	T
Poaceae				
<i>Imperata cylindrica</i> (L.) Raeusch.		Afrotropical	perennial herb	F

ability to reproduce themselves, and to spread without direct human assistance (table 1); and (b) the non-naturalized species (table 2).

Based on cited bibliography we further analyzed the native distribution range of these exotic medicinal plants. The terminology used follows Morrone (2002), which considers the following world regions: Nearctic, Palaearctic, Neotropical, Afrotropical, Oriental, Australotropical, Andean, Cape or Afrotropical, and Antarctic. Furthermore some combinations were considered for species with a more wide range of distribution: Cosmopolitan, Pantropical, Afrotropical-Neotropical, Afrotropical-Palaearctic, Afrotropical-Oriental, Oriental-Australotropical and Nearctic-Neotropical. It has to be noted that with some species, especially the widespread, it was not possible to determine the exact range of native distribution.

Moreover, an historic contextualization of the introduction of the medicinal plants in Cape Verde was also carried out using for instance the descriptions of the English Captain Georges Roberts in 1726 (in Roberts 1980), or from the naturalist Feijó in 1797, in charge of collecting information on the natural productions and responsible for the first herbarium representing the Cape Verde flora (in Feijó 1986). Other historical documents with descriptions and information referring to the colonization of these islands were used, e.g. Senna 1818 (in Senna 1987), Chelmicki & Varnhagen 1841, and Valdez 1864.

In addition to the mentioned studies and taking into consideration the fact that most of the slaves that initially populated Cape Verde came from Guinea-Bissau, we further compared the exotic medicinal flora of both countries using Catarino et al. (2008) checklist.

RESULTS

Exotic flora used in traditional medicine

A total of 101 naturalized exotic species were reported in traditional medicine in the different islands of Cape Verde. The Dicotyledons with 92 species constitute the highest number of plants used for medicinal purposes. Also nine Monocoty-

ledonous were reported in our study. Most of these taxa are herbaceous, annual or biannual plants. However, some shrubs (e.g. *Vernonia colorata*, *Opuntia ficus-indica*, *Jatropha curcas*, *Lavandula dentata*, *Indigofera tinctoria*, *Sesbania grandiflora*, *Gossypium barbadense*, *Gossypium hirsutum*, *Ruta chalepensis*, *Capraria biflora*, *Lantana camara*), small trees (*Leucaena leucocephala*, *Sapindus saponaria*), and trees (*Tamarindus indica*, *Lonchocarpus laxiflorus*, *Melia azedarach*) have also been reported (table 1).

The present study revealed that the naturalized dicotyledonous species belonged to 28 families. The families with a greater number of medicinal species are the Fabaceae with fourteen species, the Asteraceae and the Malvaceae with twelve species each, the Amaranthaceae with eight species, and the Solanaceae with seven species (see table 1). The genera with the highest number of species are: *Sida* with four species; and *Amaranthus* and *Datura* with three species each. When referring to the monocotyledonous species naturalized in Cape Verde, of the five families with plants used in traditional medicine, the Cyperaceae is the family with more species, four taxa. On the other hand, concerning the Poaceae, which exists in large numbers in the archipelago (~ 120 grass species both native and exotic, see Duarte et al. 2008), only one species is referred to as being medicinal, *Imperata cylindrica* (table 1). Several other uses were registered for the grasses in Cape Verde, namely as pasture and foraging (data not shown).

The analysis of the non-naturalized exotic species with medicinal interest revealed that nineteen taxa belong to the medicinal flora of this archipelago. These taxa are distributed in ten families, of which eight are leguminous species (five Fabaceae and three Mimosaceae) (table 2). Most of these are woody perennial species, being mainly distributed across the islands of Santo Antão and Santiago, where the agricultural activity is higher.

Distribution of Cape Verde's medicinal exotic plants

Regarding the worldwide distribution of the medicinal naturalized species (fig. 2) four main groups were observed: (a) Afrotropical species, of which the majority are from West

Table 2 – Checklist of the exotic cultivated medicinal plants of Cape Verde Islands.

(a), in the case of recent nomenclatural changes, synonyms commonly employed in Cape Verdean botanical literature are included; (b), the terminology used follows Morrone (2002). Whenever possible, the distribution of each taxon concerns to its native geographic range; (c), Cape Verde Islands abbreviations: A, Santo Antão; V, São Vicente; N, São Nicolau; S, Sal; B, Boavista; M, Maio; T, Santiago; F, Fogo; and Br, Brava.

family scientific name ^(a)	local name	native Distribution ^(b)	habit	distribution in Cape Verde ^(c)
Bombacaceae				
<i>Adansonia digitata</i> L.	calabaceira, caxabuqueira	Afrotropical	tree	A, M, F
Crassulaceae				
<i>Kalanchoe daigremontiana</i> Raym.-Hamet & H.Perrier (= <i>Bryophyllum daigremontianum</i> (Raym.-Hamet & H.Perrier) A.Berger)	bálsamo	Afrotropical	perennial herb	A
Euphorbiaceae				
<i>Euphorbia tirucalli</i> L.	aveloz	Afrotropical- Oriental	shrub	S
<i>Manihot esculenta</i> Crantz	mandioca	Neotropical	shrub	A, V, N, S, B, M, T, F, Br
<i>Manihot carthagenensis</i> (Jacq.) Müll.Arg. subsp. <i>glaziovii</i> (Müll.Arg.) Allem (= <i>Manihot glaziovii</i> Müll.Arg.)	maniçoba	Neotropical	shrub	T
Lauraceae				
<i>Persea americana</i> Mill.	abacateiro	Neotropical	shrub or small tree	A, T, Br
Leguminosae (s. lat.)				
Fabaceae				
<i>Arachis hypogaea</i> L.	amendoim, mancarra	Neotropical	annual herb	T
<i>Canavalia ensiformis</i> (L.) DC.	fabatona, feijão-porco	Oriental	annual herb	T, Br
<i>Lablab purpureus</i> (L.) Sweet subsp. <i>purpureus</i>	feijão pedra, fixon	Oriental	annual herb	A, N, S, T, F, Br
<i>Lonchocarpus sericeus</i> (Poir.) Kunth ex DC.		Afrotropical- Neotropical	shrub or small tree	T, F
<i>Phaseolus lunatus</i> L.	n'bonge	Neotropical	annual or biennial herb	A, T, F, Br
Mimosaceae				
<i>Albizia lebbek</i> (L.) Benth.	coração-de-negro; pau-feijão	Oriental	tree	S, T, F
<i>Pithecellobium dulce</i> (Roxb.) Benth.	acácia-mineira	Neotropical	tree	F, Br
<i>Samanea saman</i> (Jacq.) Merr.	árvore-da-chuva; pau- feijão	Neotropical	tree	Br
Meliaceae				
<i>Trichilia roka</i> (Forssk.) Chiov. (= <i>Trichilia emetica</i> Vahl)	mafurreira	Afrotropical- Palaeartic	shrub or small tree	T
Myrtaceae				
<i>Eucalyptus camaldulensis</i> Dehnh.	calipro	Australotropical	tree	A, T, F
Punicaceae				
<i>Punica granatum</i> L.	romã, romanzeira	Palaeartic	shrub or small tree	A, N, T, F, Br
Solanaceae				
<i>Nicotiana tabacum</i> L.	erva-brava, erva- santa, tabaco	Neotropical	annual or perennial herb	A, N, T, F, Br
<i>Solanum melongena</i> L.	beringela, beringelo, bringela	Oriental	annual or perennial herb	A, T

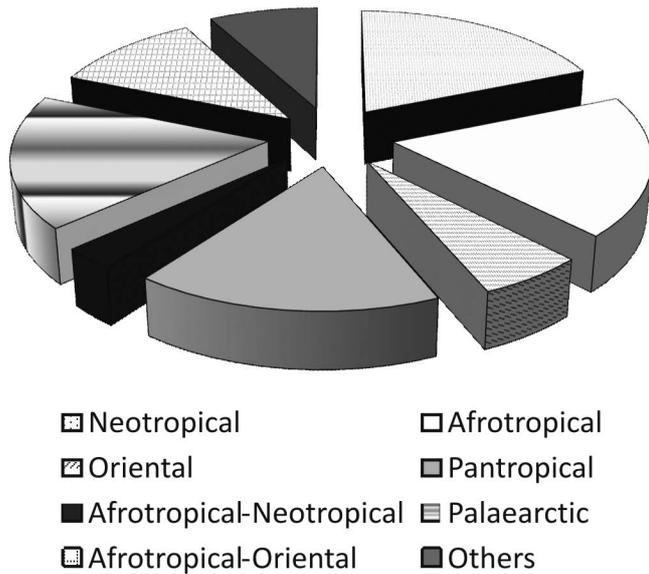


Figure 2 – Distribution of naturalized exotic species used in traditional medicine in Cape Verde Islands.

Africa (e.g. *Celosia trigyna*, *Heliotropium pterocarpum*); (b) Palaeartic species, many of which are from the Mediterranean region (e.g. *Lavandula dentata*, *Ruta chalepensis*); (c) Neotropical species namely from Brazil and Mexico such as *Datura innoxia* and *Leucaena leucocephala*; (d) and Pantropical species such as *Ageratum conyzoides*, *Momordica charantia*, *Clitoria ternatea*, and *Cyperus esculentus* (table 1). Among the species which are distributed between two biogeographical regions there is a predominance of the Afrotropical-Oriental.

From the analyses of the non-naturalized medicinal species used in traditional medicine of Cape Verde it was revealed that the majority are from Neotropical or Oriental (Asia) regions (fig. 3); on the other hand species from Palaeartic regions are not numerous, as opposed to what happens with naturalized medicinal species (see fig. 2). The predominance of the elements from Latin America and Tropical Asia is related to the fact that these are the places of origin and domestication of a large number of the species cultivated in the archipelago, like beans (*Canavalia ensiformis*, *Lablab purpureus* subsp. *purpureus*, *Phaseolus lunatus*), peanuts (*Arachis hypogaea*) or manioc (*Manihot esculenta*).

Half of the exotic medicinal species from Cape Verde (tables 1 & 2) is present in Guinea-Bissau (see Catarino et al. 2008), although it was found that only a reduced number are used as medicinal in both countries. For instance: *Abrus precatorius* (used for male impotence and tooth aches), *Spermacoce verticillata* (used for kidney problems and belly aches), *Chamaecrista absus* (to heal furunculosis and fever), *Chamaecrista nigricans* (used to treat wounds, as a purgative, and to treat worm problems), *Ocimum basilicum* (used to treat colds), *Senna occidentalis* (for venereal diseases, fevers or eye problems), are some of the species commonly used in the traditional medicine in Guinea-Bissau and Cape Verde Islands. Furthermore, many other species, used as me-

dicinal in Cape Verde, are referred to as alimentary (*Amaranthus spinosus*, *Amaranthus viridis*, *Adansonia digitata*), for phytochemical uses (*Acanthospermum hispidum*, *Indigofera tinctoria*), or for textile manufacturing (*Hibiscus cannabinus*, *Gossypium hirsutum*) in Guinea-Bissau.

DISCUSSION

As a result of human colonization and also of trading routes during the Age of Discoveries, most of the flora of Cape Verde archipelago is presently constituted by exotic naturalized species (Duarte & Romeiras 2009). The use of local flora in folk medicine is common in Cape Verde, and 101 exotic plants, i.e. about 20% of total exotic flora, were reported as medicinal in this archipelago. As a consequence of the hot and dry climatic conditions most of them correspond to annual or biannual herbs as with the overall flora.

Although, the introduction of useful plants in the Cape Verde Islands occurred at the same pace as their occupation (Barcellos 1899), for the 16th, 17th and the 18th centuries, there is no concrete information on medicinal plants used by the populations of this archipelago (Albuquerque 1991). One of the first descriptions of medicinal plants and how the local people used them in healing certain diseases was made by Feijó in 1797 (in Feijó 1986). Furthermore, in Filho (1995) an old description (from 1798) reported that an infusion of the leaves of the plant commonly named *fedegosa* (*Chenopodium ambrosioides*; see table 1) was used to help in labor, facilitating the uterine contractions: relaxation of the pelvic muscles and increase the resistance of blood vessels to prevent postpartum bleeding. According to Varela (1999, 2001), *C. ambrosioides* continued to be reported as an important medicinal plant with several applications in Cape Verde as well as in other tropical and subtropical areas. For instance, in Central and South America the leaves and flowers are presently used to stimulate labor, menses regulation and to treat abnormal uterine bleeding (Ososki et al. 2002), and in West Africa is used to stimulate blood flow in the pelvic area and uterus (Berhaut 1974). So, one of the most ancient descriptions about the traditional use of *C. ambrosioides* in the Cape

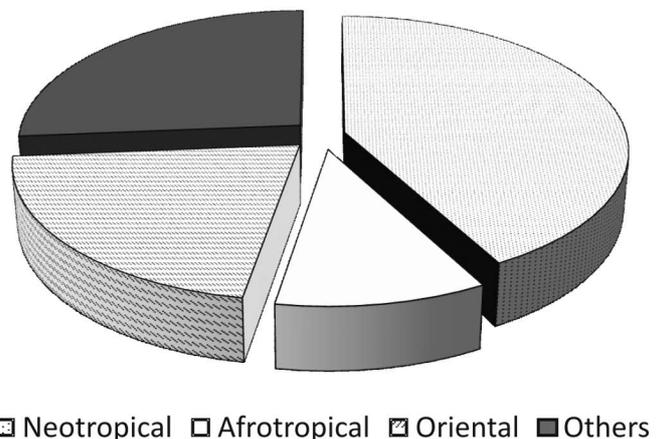


Figure 3 – Distribution of non-naturalized exotic species used in traditional medicine in Cape Verde Islands.

Verde Islands seems to reflect the current modern use of this plant in different parts of the world.

As it was noted, the position of these islands in the Atlantic Ocean allowed a rapid colonization, especially during the 18th–19th centuries. Several medicinal plants were introduced and adopted by Portuguese immigrants, although the traditional knowledge on the Cape Verde Islands was particularly influenced by African slaves. According to Torrão & Soares (2009), African slaves were subjected to severe workloads and unbearable living conditions and were forced to cure their own illnesses with local medicinal plants. These slaves, that initially colonized this archipelago or whilst en-route to Latin America, brought with them the knowledge of the uses of the local flora which is reflected in the predominance of elements Afrotropical and Neotropical highlighted in our studies. Regarding the exotic flora of Palaearctic distribution it is assumed that this is undoubtedly linked to the introduction of plants by the Portuguese during the whole process of colonization of the islands; species like *Foeniculum vulgare*, *Plantago major* or *Rosmarinus officinalis* are commonly used as medicinal in Portugal. Because of their economical interest, many of the plants were introduced by the Portuguese and other Europeans, which had in this way an important role in defining the composition of the flora of these islands. In this context, Ribeiro (1955) refers to Cape Verde as a centre of concentration and diffusion for plants, animals and men, as probably none other in the tropical regions; and Ferrão (1991) refers to the islands of Cape Verde as playing a role of extraordinary importance in the exchange of plants and worked as ‘gardens’ of acclimatization for plants from many places.

It was noted that the African slaves have certainly shaped the present day use of medicinal plants in the Cape Verde Islands, where the majority of the rural population still uses some plants to treat diseases. This comes as no surprise as the African continent has a long and impressive list of medicinal plants based on local knowledge (e.g. Burkill 1985, 1994, 1995, 1997, 2000, Schmelzer & Gurib-Fakim 2008). In Africa, traditional healers and remedies made from plants play an important role in the health of millions of people (e.g. Ayensu 1978). Every region has a form of traditional medicine, which varies from one community to another and is deeply rooted in a specific socio-cultural context (Oliver-Bever 1986, Rukangira 2001). For instance the roots and leaves of *Abrus precatorius* subsp. *africanus*, a tropical plant found in almost all of the West African countries are used in Cape Verde for conjunctivitis and skin diseases (Varela 1999, 2001). According to the Flora of Senegal (Berhaut 1976) this plant is widely used for broad applications such as: respiratory infections and cough; to cure anaemia; abortifacient. Meanwhile, in Guinea-Bissau, the dried root is used for “toothache and stomach aches”, and it is also understood to have an aphrodisiac effect (Catarino et al. 2006). Likewise, *Jatropha curcas* (Parawira 2010), a Euphorbiaceae described as medicinal in Cape Verde has an actual worldwide economic importance. This species is a drought-resistant perennial shrub, adapted to the arid and semi-arid conditions of all the Cape Verde Islands. The oil of its seeds can be combusted as fuel without being refined and used in folk medicine as a laxative or purgative (Figueiredo 1996).

The infant mortality in Cape Verde is among the very lowest in the West African region, the major health problems are related either with childhood diseases (e.g. diarrhoea, respiratory infections and cough), fevers, skin infections, urinary diseases or eye inflammations (Varela 1999, 2001). Most of these diseases are caused by poor hygiene, particularly the lack of treated water in rural areas. It is to be noted that Cape Verde has a relatively low prevalence of HIV/AIDS (Larsen et al. 1998), limited cases of malaria have been reported in Santiago Island, and tuberculosis appears only from time to time (Wessel et al. 1999) contrary to the other Sub-Saharan African countries. So, in Cape Verde the situation is not as serious as in other African countries; nevertheless, medical facilities in this archipelago are limited. For instance, there are only two central hospitals (in Mindelo, São Vicente Island and in Praia, Santiago Island); and Brava and Santo Antão no longer have functioning airports, and air evacuation, only by helicopters, is extremely difficult from these two islands. So, the cost of pharmaceuticals, the difficulty of reaching the two central hospitals, as well as limited availability of doctors, especially in the rural areas, most likely contributes to the widespread continued use of plants for medicinal purposes in this archipelago.

Finally, we would like to clarify that very few papers concerning aspects of the folk plant traditions have been published for Cape Verde Islands. Moreover interviews with traditional healers from these islands have scarcely been done and so, further field studies must be organized for a better characterization of the medicinal Cape Verde flora.

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