

**DICOTYLEDONES IN SOME GREEN AREAS IN LISBON.
THE ACHLAMYDEOUS AND THE HAPLOCHLAMYDEOUS**

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There are several remarkable green areas in Lisbon, namely
“Jardim-Museu Agrícola Tropical”, “Tapada da Ajuda” and
“Estufa Fria de Lisboa”. Plant collections from different
floristic regions of the world are conserved in these areas.
Several species of achlamydeous and haplochlamydeous
dicotyledones included in these collections can be found. The
identification of the species was made through morphological
external characters of specimens cultivated in those areas.
The *taxa*, their wild origin, some of their uses by man and
their presence in the respective green area are pointed out.
For the threatened species, the conservation status according
to IUCN categories is mentioned. The areas studied are
privileged as they are responsible for the *ex situ* biodiversity
conservation. Presently these areas are also very important
for research, as well as for didactic and educational
programmes.

Keywords: Taxonomy, biodiversity, conservation.

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Em Lisboa existem diversos espaços verdes notáveis,
nomeadamente: Jardim-Museu Agrícola Tropical, Tapada da
Ajuda e Estufa Fria de Lisboa. Nestes locais encontram-se
conservadas colecções de plantas de diversas regiões
florísticas do mundo. Várias espécies de dicotiledóneas

aclamídeas e haploclamídeas, estão incluídas nestas colecções. A identificação das espécies cultivadas nos espaços acima mencionados foi feita através dos seus caracteres morfológicos externos. Apresentam-se os *taxa*, a sua origem natural, alguns dos seus usos para o homem, o estatuto de conservação dos ameaçados na Natureza de acordo com as categorias da IUCN e a sua distribuição nas áreas estudadas. Os locais mencionados são privilegiados por serem responsáveis pela conservação da biodiversidade *ex situ*. Actualmente estes espaços são também muito importantes quer para a investigação, quer para programas didácticos e educacionais.

Palavras chave: Taxonomia, biodiversidade, conservação.

INTRODUCTION

The Botanic Gardens and parks played a crucial role in the introduction and adaptation of plant species from several regions of the world.

In Lisbon we find "Jardim-Museu Agrícola Tropical", "Tapada da Ajuda", "Estufa Fria de Lisboa", "Jardim Botânico de Lisboa" and others, as important sites of this kind.

The first three mentioned sites are the areas where the authors have been developing, since several years, research phytotaxonomic projects (CAIXINHAS, 1994; LIBERATO, 1994; LOUSÁ & VASCONCELOS, 1998). These works are still carrying on.

"Jardim-Museu Agrícola Tropical" (Tropical Agricultural Museum-Garden) was created as Colonial Garden in 1906 inside Conde Farrobo's Garden.

This garden was created as pedagogical subordination of "Instituto Superior de Agronomia", in order to support the "ensino agronómico colonial" (agronomic colonial teaching). Some of its aims were to train technicians on propagation and selection of useful plants that would be cultivated in the colonies and also on culture and diseases of tropical plants. Those technicians were prepared to carry out their activity in the Portuguese colonies.

In 1914 this garden was transferred to the present site, including a botanical park of about 5 hectares with greenhouses.

In 1919 the objectives of the Colonial Garden were enlarged and we can refer among them to promote the introduction and acclimatization of economic and exotic plants in Portugal.

In 1945 the pedagogic subordination to "Instituto Superior de Agronomia" ceased. In 1949 the garden started the publication of its *Index Seminum*.

Nowadays, since 1974, it is a Research Centre of "Instituto de Investigação Científica Tropical". It conserves in its park a valuable collection of tropical and subtropical plants. The study, developing and maintenance of this collection are among the aims of this Centre (INSTITUTO DE INVESTIGAÇÃO CIENTÍFICA TROPICAL, 1983).

"Tapada da Ajuda" (Royal Park of Ajuda) has served since the 18th century as a hunting-ground for kings and aristocrats. In the 19th century was built, during King Luis reign, the Astronomic Observatory, considered one of the most remarkable in Europe at that time.

It belongs to "Instituto Superior de Agronomia" since 1918, being the pedagogical support for most of the subjects taught in this College.

Today "Tapada da Ajuda" is a botanical park and the vegetal blanket has been enriched by the introduction of plants, mainly shrubs and trees. The botanical area consists of some 80 hectares.

In 1962 Prof. João de Carvalho e Vasconcellos has co-ordinated the first "Instituto Superior de Agronomia" *Index Seminum*.

The wild flora of Lisbon is well represented in the Botanic Reserve "D. António Xavier Pereira Coutinho" (COUTINHO, 1956).

"Estufa Fria de Lisboa" (Cold Greenhouse of Lisbon) was built in the first decade of this century. A gardener began to place pots of delicated plants on a area protected from north and cold winds in an ancient stone-spit existing in the area where later the "Parque Eduardo VII" was constructed.

In the same place a big covering was created to protect the most sensitive plants from Lisbon's ecological conditions. From this initiative "Estufa Fria de Lisboa" appeared.

Nowadays it has more than one hectare protected by a fence of green wooden strips. It is considered to be a living museum of vegetation (CAIXINHAS, 1994).

The living plants growing in the green areas above mentioned contribute to their esthetical and biological valorisation.

The species presented in this work are a good example of the wide range of ecological conditions that may be observed in these sites.

The goal of this communication concerns only the achlamydeous and haplochlamydeous dicotyledones conserved in the mentioned areas. These species are very interesting plants in which the perianth is absent or is on a single whorl respectively.

Thus the mentioned spaces must be regarded as privileged places for the maintenance of the biodiversity *ex situ*.

MATERIAL AND METHODS

It was done the taxonomic study of dicotyledones achlamydeous and haplochlamydeous species conserved in the garden of "Jardim-Museu Agrícola Tropical" (JMAT), "Tapada da Ajuda" (TA) and "Estufa Fria de Lisboa" (EFL) including the Hot Glasshouse (EQ) and Sweet Glasshouse (ED) (CAIXINHAS, 1994; COUTINHO, 1956; LIBERATO, 1994; LOUSÁ & VASCONCELOS, 1996, 1998).

The species were identified using the morphological external characters according to CULLEN *et al.* (1997), FRANCO (1943, 1971, 1984), HUXLEY *et al.* (1992), LIBERTY HYDE BAILEY HORTORIUM (1976), TUTIN *et al.*

(1968, 1972, 1993), WALTERS *et al.* (1989) and compared with verified herbarium specimens.

The author's names follow BRUMMITT & POWELL (1992).

To each taxa was studied their area of origin, some uses by man (MABBERLEY, 1997), the conservation status of those threatened in wildlife with notes about the IUCN categories (WALTER & GILLET, 1998) and their distribution on the green areas studied.

RESULTS

The IUCN categories, natural origin, some uses by man of dicotyledones achlamydeous and haplochlamydeous taxa that are growing in the green areas studied are presented on Table 1.

The ordines presentation follows MELCHIOR (1964). The families and species are listed by alphabetically order.

Table 1 - Achlamydeous and haplochlamydeous collections

TAXA	IUCN CAT	ORIGIN*	USE	DISTRIBU- TION
CASUARINALES				
Casuarinaceae				
<i>Casuarina cunninghamiana</i> Miq		SE Austr.	timber, fuelwood, windbreak, pioneer seashore, street tree	JMAT, TA
<i>Casuarina equisetifolia</i> J.R. Forst. & G. Forst.		SE Asia to NE Austr. & Polynesia	timber, fuelwood, windbreak, pioneer seashore, street tree	TA
<i>Casuarina stricta</i> Aiton		S & SE Austr.	timber, fuelwood, windbreak, pioneer seashore, street tree	TA
JUGLANDALES				
Juglandaceae				
<i>Juglans nigra</i> L. <i>Juglans regia</i> L.		E USA SE Eur. to Himalaya & China., C Russia	edible nuts, timber edible nuts, timber	JMAT, TA TA
<i>Pterocarya fraxinifolia</i> (Lam.) Spach		Caucasus to Iran	street tree, ornamental	TA
SALICALES				
Salicaceae				
<i>Populus alba</i> L.		S, C, E Eur., N Afr. to C Asia	timber, pulp-wood	JMAT, TA, EFL
<i>Populus candicans</i> Aiton		perhaps cultivated	timber, ornamental	JMAT
<i>Populus deltoides</i> Marshall		SE USA	timber	TA
<i>Populus nigra</i> L. ssp. <i>nigra</i>		C, E Eur. & N Afr.	timber, pulp-wood	JMAT, TA, EFL
<i>Populus nigra</i> L. ssp. <i>betulifolia</i> (Pursch) W. Wettst.		W Eur.	timber, pulp-wood	JMAT
<i>Populus trichocarpa</i> Torr. & Hook. 'Pendula'		cultivated	ornamental	JMAT

TAXA	IUCN CAT	ORIGIN*	USE	DISTRIBU- TION
FAGALES				
Betulaceae				
<i>Alnus glutinosa</i> (L.) Gaertn.		Eur. to Caucasus & Siberia, N Afr.	timber, tannin, medicinal	TA
Corylaceae				
<i>Corylus avellana</i> L.		Eur.	edible nuts, hedges	TA
Fagaceae				
<i>Castanea sativa</i> Mill.		S Eur., NW Afr. & SW Asia	edible nuts, timber	TA
<i>Fagus sylvatica</i> L.		C Eur. to Caucasus	oil, medicinal	TA
<i>Quercus coccifera</i> L.		W Mediter., S Eur., NW Afr.	timber, tannin	TA
<i>Quercus x coutinhoi</i> Samp.		Portugal	ornamental	TA
<i>Quercus faginea</i> Lam.		Spain & Portugal	ornamental	TA
<i>Quercus ilex</i> L. ssp. <i>ilex</i>		Mediter. to N Spain & W France	acorns, timber, fuelwood	TA
<i>Quercus ilex</i> L. ssp. <i>rotundifolia</i> (Lam.) T. Morais		Spain & Portugal	acorns, timber, fuelwood	JMAT, TA
<i>Quercus robur</i> L.		Eur. to W Russia	timber, ornamental	TA
<i>Quercus suber</i> L.		N Afr., S Eur.	cork, acorns	JMAT, TA
URTICALES				
Eucommiaceae				
<i>Eucommia ulmoides</i> Oliv.	R	C China	timber, rubber, medicinal	JMAT
Moraceae				
<i>Ficus altissima</i> Blume		S & SE Asia to Malesia	shade tree	JMAT
<i>Ficus benjamina</i> L.		S & SE Asia through Malesia to N Austr.	ornamental	TA
<i>Ficus carica</i> L.		Cyprus, Turkey & Caucasus to Afghanistan	fruit tree	JMAT, TA
<i>Ficus elastica</i> Hornem.		E Himalaya to N Malay Peninsula, Sumatra & Java cultivated	rubber	JMAT
<i>Ficus elastica</i> Hornem. 'Decora'			ornamental	JMAT, TA
<i>Ficus elastica</i> Hornem. 'Variegata'		cultivated	ornamental	JMAT, EFL
<i>Ficus macrophylla</i> Pers.		Austr.	ornamental	JMAT, TA
<i>Ficus microcarpa</i> L.		Ryukyu Is, S Chi- na, S & SE Asia	ornamental	JMAT
<i>Ficus pumila</i> L.		E Asia	ornamental	JMAT, TA, EFL
<i>Ficus religiosa</i> L.		SW China, N Thai land & Vietnam	ornamental, sacred tree	JMAT
<i>Ficus rubiginosa</i> Vent.		Austr.	ornamental	TA
<i>Ficus rumphii</i> Blume		S & SE Asia	ornamental	JMAT
<i>Ficus sycomorus</i> L.		E Afr., Arabian Peninsula	fruit tree, timber	JMAT

TAXA	IUCN CAT	ORIGIN*	USE	DISTRIBU- TION
<i>Maclura pomifera</i> (Raf.) C. K. Schneid.		USA	timber, windbreak, dyer	JMAT, TA
<i>Morus alba</i> L.		China	leaves are food for silk- worms, street tree	JMAT, TA
Ulmaceae				
<i>Celtis australis</i> L.		Mediterr., Middle East	street tree	JMAT, TA
<i>Celtis occidentalis</i> L.		N Amer.	street tree	TA
<i>Ulmus pumila</i> L. var. <i>arborea</i> Litv.		E Siberia, N China, Turkestan	ornamental	TA
<i>Zelkova serrata</i> (Thunb.) Makino		Japan, Taiwan, E China	street tree	TA
Urticaceae				
<i>Pilea cardierei</i> Gagnep. & Guillaumin		Vietnam	ornamental	EFL (EQ)
<i>Pilea involucrata</i> (Sims) Urb.		C & S Amer.	ornamental	EFL (EQ)
PROTEALES				
Proteaceae				
<i>Banksia aemula</i> R. Br.		E Austr.	ornamental	TA
<i>Banksia integrifolia</i> L. f.		E Austr.	ornamental	TA
<i>Grevillea robusta</i> A.M. Cunn. ex R. Br.		E Austr.	timber, cultivated as coffee-shade, street tree	JMAT, TA
POLYGONALES				
Polygonaceae				
<i>Homalocladium platycladum</i> (F. Muell.) L.H. Bailey		Solomon Is.	ornamental	TA
<i>Muehlenbeckia complexa</i> (A. Cunn.) Meisn.		New Zealand	ornamental	TA
CENTROSPERMALES				
Amaranthaceae				
<i>Deeringia amaranthoides</i> (Lam.) Merr. 'Variegata'		cultivated	ornamental	EFL
<i>Iresine herbstii</i> Hook.		Brazil	ornamental	TA, EFL (EQ)
<i>Iresine lindenii</i> Van Houtte		Ecuador	ornamental	EFL (EQ)
Chenopodiaceae				
<i>Atriplex halimus</i> L.		Mediterr. area, N Afr. & W Asia	Salt tolerant, forage, hedge	TA
<i>Atriplex hortensis</i> L.		Asia	edible leaves	TA
Nyctaginaceae				
<i>Bougainvillea x buttiana</i> Holtum & Standl.		cultivated	ornamental	JMAT, EFL (EQ)
<i>Bougainvillea glabra</i> Choisy		Brazil	ornamental	JMAT, TA
<i>Bougainvillea glabra</i> Choisy 'Variegata'		cultivated	ornamental	EFL
<i>Bougainvillea spectabilis</i> Willd.		Brazil	ornamental	JMAT
<i>Pisonia umbellifera</i> (J.R. Forst. & G. Forst.) Seem.		Mauritius, Austr. & New Zealand	ornamental	EFL
Phytolaccaceae				
<i>Phytolacca americana</i> L.		N & C America	dyer, medicinal	TA

TAXA	IUCN CAT	ORIGIN*	USE	DISTRIBU- TION
<i>Phytolacca dioica</i> L.		S America	shade tree, ornamental	JMAT, TA, EFL
PIPERALES				
Piperaceae				
<i>Peperomia caperata</i> Yunck.		Brazil ?	ornamental	JMAT, EFL (EQ)
<i>Peperomia griseo-argentea</i> Yunck.		Brazil ?	ornamental	JMAT, EFL (EQ)
<i>Peperomia obtusifolia</i> (L.) Dietr.		Mexico to N of S Amer.	ornamental	JMAT, EFL (EQ)
<i>Peperomia obtusifolia</i> (L.) Dietr. 'Variegata'		cultivated	ornamental	EFL (EQ)
<i>Peperomia serpens</i> (Sw.) Loudon		Panama to Brazil, Peru & W Indies	ornamental	EFL (EQ)
ROSALES				
Leguminosae				
<i>Ceratonia siliqua</i> L.		Mediterr. area, Arabia to Somalia	pulp to foodstuff, fruit to animal fodder	TA
GERANIALES				
Euphorbiaceae				
<i>Codiaeum variegatum</i> (L.) Blume var. <i>pictum</i>		cultivated	ornamental	JMAT, TA, EFL (EQ, ED)
<i>Euphorbia atropurpurea</i> Brouss.		Canary Is.	ornamental	TA
<i>Euphorbia balsamifera</i> Aiton		NW Afr., Canary Is. & Somalia	ornamental	TA
<i>Euphorbia canariensis</i> L.		Canary Is.	ornamental	JMAT, EFL (ED)
<i>Euphorbia coerulescens</i> Haw.		S Afr.	ornamental	EFL (ED)
<i>Euphorbia cotinifolia</i> L.		Mexico to S Amer.	ornamental	EFL (EQ)
<i>Euphorbia grandicornis</i> Goebel		S Afr.	ornamental	JMAT, EFL (ED)
<i>Euphorbia ingens</i> E. Mey.		S Afr. to Kenya	ornamental	JMAT, TA
<i>Euphorbia milii</i> Des Moul. var. <i>splendens</i> (Hook.) Ursch & Leandri		Madagascar	ornamental	JMAT, TA, EFL (EQ)
<i>Euphorbia pseudocactus</i> A. Berger		S Afr.	ornamental	JMAT, EFL (ED)
<i>Euphorbia pulcherrima</i> Klotzch		W Mexico	ornamental	JMAT, TA, EFL (EQ, ED)
<i>Euphorbia tirucalli</i> L.		Tropical & S Afr., E India to Indonesia	source of hydrocarbons for fuel, charcoal, ornamental	JMAT, EFL (EQ, ED)
<i>Euphorbia trigona</i> Haw.		Unknown origin	ornamental	EFL (ED)
<i>Mallotus japonicus</i> (Thunb.) Müll. Arg.		Japan, China & Korea	ornamental	TA
<i>Ricinus communis</i> L.		NE Afr. to Middle East	oil, medicinal	JMAT, TA

TAXA	IUCN CAT	ORIGIN*	USE	DISTRIBU- TION
<i>Synadenium grantii</i> Hook. f.		Uganda to Zimbabwe, Mozambique	ornamental	TA
SAPINDALES				
Anacardiaceae				
<i>Pistacia lentiscus</i> L.		Mediterr. except NE Afr.	mastic, varnishes for oil pictures	TA
<i>Pistacia vera</i> L.		W Asia	edible nuts	JMAT
CELASTRALES				
Buxaceae				
<i>Buxus sempervirens</i> L.		S Eur., W Asia, N Afr.	hedges, timber, ornamental	JMAT, TA, EFL
RHAMNALES				
Rhamnaceae				
<i>Colletia paradoxa</i> (Spreng.) Escal.		Uruguay, S Brazil	ornamental	JMAT, EFL (ED)
<i>Rhamnus alaternus</i> L.		S Portugal, N Afr. & SE Russia	ornamental	TA
<i>Rhamnus lycioides</i> L. ssp. <i>oleoides</i> (L.) Jahand. & Maire		Mediterr. area to Portugal	ornamental	TA
MALVALES				
Sterculiaceae				
<i>Brachychiton acerifolius</i> (A. Cunn.) F. Muell.		Austr.	ornamental	JMAT, EFL (EQ)
<i>Brachychiton populneus</i> (Schott & Endl.) R. Br.		Austr.	ornamental	JMAT
THYMELAEALES				
Elaeagnaceae				
<i>Elaeagnus angustifolia</i> L.		SE Eur. to W Asia	ornamental	JMAT
<i>Elaeagnus pungens</i> Thunb.		China & Japan	ornamental	TA
OLEALES				
Oleaceae				
<i>Fraxinus angustifolia</i> Vahl ssp. <i>angustifolia</i>		S Europe & N Afr.	street tree	JMAT, TA

*Afr. – Africa; Amer. – America; Austr. – Australia; Eur. – Europa; Mediter. – Mediterranean.

CONCLUSIONS

We can reach the following conclusions:

- Within the green areas studied they were identified 95 species or infra-specific taxa of achlamydeous and the haplochlamydeous dicotyledones;
- Those mentioned taxa are original of several regions of the world;
- The taxa studied provide a wide range of uses to man. These include food (e.g. leaves), fruit, edible nuts and acorns trees, timber, pulp-woods, tannins, cork, fuelwood, rubber, oil, mastic, varnishes, medicinal, street and shade trees, dyers, hedges, windbreak, pioneer seashores and ornamentals;
- Among the taxa studied was found *Eucommia ulmoides* Oliv. with the status of Rare in the wildlife according to the IUCN Red List Categories;

- We consider these areas very important for the *ex situ* biodiversity conservation;
- These living museums of vegetation are also relevant for research, as well as for didactic and educational programmes.

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