LAWN FLORA IN TWO SPANISH MEDITERRANEAN CITIES

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ABSTRACT: A catalogue of vascular plants observed in the lawns of two Mediterranean cities of the NE Iberian Peninsula is presented. These include both the intentionally sown species and the unintentionally present wild flora, normally referred to as weed species. The umbellifer *Bowlesia incana*, the composite *Hypochaeris radicata* subsp. *rocinensis* and the poorly recorded Mediterranean grass *Poa maroccana* constitute interesting records for the coastal region, the first two being new for Catalonia. The New World composite weed *Soliva sessilis* is now known to be spreading in many lawns of Barcelona's metropolitan area. **Keywords**: alien plants; artificial meadows; lawn; weed; Barcelona; Zaragoza; Spain.

RESUMEN: **Flora de los céspedes urbanos de dos ciudades mediterráneas españolas**. Se presenta un catálogo de plantas vasculares observadas en los céspedes urbanos de dos ciudades de clima mediterráneo del NE Península Ibérica. Se incluye tanto las especies sembradas como las que han llegado por otras vías, tanto las nativas como las subespontáneas. La umbelífera *Bowlesia incana,* la compuesta *Hypochaeris radicata* subsp. *rocinensis*, y la poco citada gramínea mediterránea, *Poa maroccana*, constituyen citas interesantes, las dos primeras son nuevas para Cataluña. La compuesta *Soliva sessilis*, de las Américas, hoy constituye un elemento cada vez más frecuente en los céspedes del entorno barcelonés. **Palabras clave**: flora adventicia; céspedes urbanos; Barcelona; Zaragoza; España.

INTRODUCTION

Most city lawns are artificial "green" areas, with irrigation and mowing making for a rather singular environment. Irregular grass coverage and maintenance favour the presence of a wide variety of species, usually considered to be weeds. The areas under study comprise the coastal city of Barcelona (Catalonia, NE Spain), with its mild maritime climate, and the inland city of Zaragoza (Aragón, NE Spain), with a drier, more continental climate. Their corresponding lawn flora composition is analysed.

Artificial environments provide modified habitats for many plant species. In particular, the presence of irrigation systems in the man-made lawns of urban areas and roadsides creates conditions suitable for many plants that would not otherwise survive the irregular, seasonal precipitation characteristic of the mediterranean climate.

Frequent mowing not only limits the presence of species, favouring those which are more resistant to mowing or grazing, but it also serves to spread the seed and vegetative remains, thus dispersing many species via the cutting implements and their operators' footwear. The depositions of feral pigeons, dogs and cats, along with lawn clippings and the occasional use of fertilizers, serve to enrich the soil with nitrogen and other elements, thus favouring nitrophiles. The high percentage of nitrogen-fixing leguminous species in lawns also contributes to this.

The result of these three factors, combined with a moderately high level of soil compaction, is a nitrogen-enriched, ruderal environment where vertical growth is severely restricted and where soil and surface humidity levels are higher than in adjacent non-irrigated sites (waste land, sites awaiting construction, road and railway embankments, etcetera), which have not been included in the results of this study. Such an environment favours the presence of, firstly, plants with a prostrate or ascending growth habit; secondly, plants that multiply or spread vegetatively (including many caespitose hemicryptophytes) and, finally, low annuals with a short life-cycle that produce a regular supply of abundant seed.

METHOD

Observations made over a period of 30 years (1991 – 2021) constitute the bulk of information in the following breakdown of species. These have been made in the entire urban area of Zaragoza (comprising lawns and green areas within an area of approximately 10 km^2), and in Barcelona and the adjacent municipalities of L'Hospitalet de Llobregat and Sant Adrià de Besòs (lawns and green areas within 15 km^2). Two regional capitals, both on a similar latitude, approximately 41°20'N (Barcelona) and 41°40'N (Zaragoza). A number of specimens have been conserved in herbaria (JACA, VAL and BC), these corresponding to plants not or little cited from the two study areas, or to a couple of floristic projects carried out in Zaragoza (PYKE, 2003a, 2021) and on the hill area of Montjuïc, Barcelona (FARELO & al., 2022). Plant authors' names are included in the catalogue, except in the case of species not included in these three lists.

In this case study, the term 'lawn' can be defined as 'a green area sown or planted with gramineous plants or a substitute for grass, such as *Dichondra micrantha*, and

cut on a more or less regular basis in order to promote horizontal growth and thus maintain a low sward. Additionally, in Mediterranean lawns, an irrigation support system is normally present in order to prevent stress and death due to the drought conditions typical of the summer and often also of winter and other times of year. This creates an artificial habitat which promotes the presence of plant species that would otherwise be rare or absent from the general area, or found only in wetlands. The degree of care taken in the maintenance of these green areas determines the type and abundance of species present. Seldom mown green areas, for instance, would attract an increased percentage of taller annual, biennial and perennial weeds such as *Rumex* spp., *Medicago sativa* L., *Foeniculum vulgare* Mill., *Centaurea aspera* L., *Dittrichia viscosa* (L.) Greuter [*Inula viscosa* (L.) Aiton], *Sonchus* spp., *Helminthotheca echioides, Symphyotrichum squamatum* (Spreng.) G.L. Nesom (*Aster squamatus*), *Avena* spp., *Hyparrhenia hirta* L. (not Zaragoza) or even species of *Ophrys* and *Orobanche*. On the other hand, if the lawns are frequently mown, fewer invading species will prosper, unless their growth form is of a low or prostrate type, such as *Lotus* and *Trifolium* species, *Sherardia arvensis*, or some species of *Veronica* and *Cerastium*. Frequent mowing can reduce the spread of, or even eliminate, species often found in lawns, such as *Hypochaeris radicata* or *Plantago* spp., since the cutting of their scapes will impede flowering and therefore minimise the chances of sexual reproduction, although fresh seed can enter the lawn, especially of those species possessing a pappus, such as *Hypochaeris* and *Taraxacum*. Vegetative spread may be encouraged in various species in the case of frequent mowing. Abundant watering or a badly maintained irrigation system results in the increase of wetland species such as *Ranunculus sardous*, *Potentilla reptans, Apium nodiflorum*, *Trifolium fragiferum*, *Lythrum hyssopifolia*, *Centaurium pulchellum* and *Plantago major*. Heavily disturbed or poorly maintained lawns, with bald patches, will encourage the presence of annual weeds. *Poa annua* might be more welcome, but other less appropriate ones will appear, especially the anemochorous ones such as *Conyza sumatrensis* (Retz.) E. Walker, *C. bonariensis* (L.) Cronq., *Symphyotrichum squamatum, Helminthotheca echioides, Oenothera rosea*, etc. The persistent weeds with hypogeal reserves, among these *Cynodon dactylon* and *Cyperus rotondus*, as well as species of the bulbous genera *Oxalis*, *Nothoscordum* and *Allium*, are often present in lawns that have been badly formed, poorly maintained, or have suffered disturbance due to roadworks, cable or pipeline replacement, and so on. The first of these may have been intentionally sown, as it is commonly used in Mediterranean areas for the formation of lawns of low quality yet high durability. The use of more tropical, stoloniferous species such as the Kikuyu grass *Cenchrus clandestinus* (*Kikuyuochloa clandestina*) and *Stenotaphrum secundatum* should be discouraged, especially in the case of the former. Their introduction in areas close to protected natural habitats causes conservation problems. They are both aggressive species that may soon spread to adjacent natural areas. *Stenotaphrum* is particularly problematic in wetter places with a mild climate as, for example, on the Atlantic coasts of the Iberian Peninsula. The Kikuyu grass is fast establishing itself on the Mediterranean coast, which means that outstanding natural areas will need to be carefully monitored. The driest lawns are home to grasses like *Digitaria sanguinalis*, *Bothriochloa ischaemum* or *Eleusine tristachya*, and a wide variety of other plants, such as *Trifolium scabrum*, *Oxalis corniculatus*, *Plantago lagopus*, *P. coronopus*, *Salvia verbenaca*, *Scorzonera laciniata*, *Tribulus terrestris* or *Crepis bursifolia*, to mention but a few.

The sown ingredients have been observed, studied and checked with commercially available sources. In the Mediterranean region, such species as *Agrostis capillaris, Festuca nigrescens* Lam. (*F. rubra* subsp. *commutata* (Gaudin) Markgr-Dann. in seed mixtures) and *Festuca* "*ovina*" tend to diminish after emergence, since they are less competitive in normal Southern European conditions than species such as *Cynodon dactylon* or *Dichondra micrantha*. The penultimate, known as Bermuda grass, or "grama", though present in very small quantities in most seed mixes, often becomes dominant where lawns are neglected or irrigation is reduced for water-saving purposes.

Another grass that, in its different strains, tends to establish itself well, and persist, is *Festuca arundinacea* (*Schedonorus arundinaceus*). This species is often prominent in commercial seed mixtures, as is *F. rubra*. *Poa pratensis* strains are also quite successful. *Lolium perenne*, dominant in many more northern lawns, is often squeezed out by the warmer-climate species (including those not sown) despite its important percentage in many seed mixtures.

Zoysia is increasingly being planted, or laid as turf, and it forms a dense sward which if irrigated wisely gives good results, although it needs a rest period, during which it looks dry. A strain, or perhaps a hybrid plant, morphologically close to *Z. matrella* has been widely planted in Barcelona's neighbouring towns of Badalona and L'Hospitalet de Llobregat. It differs from Korean lawngrass, *Z. japonica* Steud., principally in its narrower inflorescence spikes and finer sward texture.

On sowing a new area, a range of weed species, annuals or not, generally establish themselves with varying degrees of success over a short period. These include plants such as *Amaranthus* spp., *Bromus madritensis, Chenopodium album* L. (s.l.), *Ch. murale* L., *Cirsium vulgare* (Savi) Ten., *Convolvulus arvensis, Conyza bonariensis, C. sumatrensis, Daucus carota* L., *Euphorbia peplus* L., *Helminthotheca echioides, Lophochloa cristata* (L.) Hyl., *Malva sylvestris* L., *Oloptum miliaceum, Poa annua, Senecio vulgaris* L., *Setaria adhaerens, Solanum spp., Sonchus tenerrimus* L., *S. asper* (L.) Hill, *Symphyotrichum squamatum, Torilis arvensis* and others.

RESULTS, AND CATALOGUE OF SPECIES OBSERVED

Sown species may include the following grasses, either unmodified or cultivars: *Festuca arundinacea, F. rubra, Lolium perenne, Poa pratensis, Dactylis glomerata, Cynodon dactylon, Stenotaphrum secundatum, Cenchrus clandestinus, Paspalum vaginatum.* Rarely, *Festuca nigrescens*, *Lolium multiflorum* Lam., *Phleum praten-*

se and *Poa subcaerulea* (*P. irrigata*) might also be included. *Festuca "ovina"* strains based on Central and Northern European *ovina* stock, particularly *F. ovina* L. subsp. *ophioliticola*, a plant that grows on well-drained basic, often calcareous but sometimes serpentine soils (WILKINSON & STACE, 1991), and *Festuca stricta* subsp. *trachyphylla* (*F. brevipila*) have also been noted. *F. trichophylla* (Gaudin) K. Richt., in one of its cultivated forms, has been observed outside the studied area, to the north-east of Barcelona. Although *Agrostis capillaris* and *A. castellana* are used in some commercial seed mixtures, they appear to have been unintentionally introduced in our lawns. The latter has become naturalised in the British Isles as a result of its use in land restoration and amenity projects (*obs. pers.*, HUBBARD, 1984).

Planted grass species include some of the above, when turf is laid, and also the *Zoysia* cultivar (mentioned above). Non-grass ingredients include *Dichondra micrantha* ("D. repens" in some seed catalogues) and *Trifolium repens*. This breakdown of species does not include certain plants extensively employed in the sowing of embankments and other areas of a rougher nature, where seed is often applied through hydro-seeding techniques. Two of the more tropical species mentioned, *Cenchrus clandestinus* (*Kikuyuochloa clandestina*) and *Stenotaphrum secundatum*, are fast becoming unwelcome invasive colonisers, especially in coastal areas of the Iberian Peninsula, and should be deleted from seed mixtures for lawns in temperate and Mediterranean climes. The former species, originating in the highlands of Ethiopia, can be observed in Barcelona and adjacent municipalities. It is common on Montjuïc, and has long replaced the sown species around the monument in Plaça Espanya. Although sensitive to very cold weather, the inner-city areas, being less prone to frosty conditions, might allow for the presence of this grass in interior cities.

Key to usual lawn conditions: D dry; H humid; N normal conditions; P patchy or poorly sown; W wet. (B = Barcelona; Z = Zaragoza)

1) Lawn flora encountered in **both cities**. Species occasionally observed in newly-sown lawns are not included.

Achillea millefolium L.
H. Rare in Z; sown intentionally in B.
Agrostis stolonifera L.
H. Occasional. Probably not sown.
Allium ampeloprasum L.
N (P). Occasional.
Amaranthus deflexus L.
P. Mainly in newly sown and poorly maintained lawns. Frequent.
Amaranthus muricatus (Moq.) Hieron.
P. Frequent and persistent in poorly maintained lawns.
Anagallis arvensis L.
N. Common
Aphanes arvensis L.
N. Rare.
Apium nodiflorum (L.) Lag.
W. Locally frequent.
Asphodelus fistulosus L.
D (P). Occasional, locally abundant.
Astragalus sesameus L.
D. Occasional. More observations in Z.
Avena barbata Pott ex Link
P. Occasional.
Bellis perennis L.
N. Common.
Bromus hordeaceus subsp. ***mediterraneus*** H. Scholz
P. Occasional.
B. madritensis L.
P. Occasional (more frequent in recently sown lawns).
B. unioloides Kunth *s.l.* [*B. willdenowii* Kunth]
N. Frequent. When considered apart, *B. willdenowii* adjusts better to our plants.
Capsella bursa-pastoris (L.) Medik.
N (P). Frequent.
Carex divulsa Stokes
N. Prefers parcial shade. Rare.
Cerastium glomeratum Thuill.
N. Frequent.
Cerastium semidecandrum L.
D. Locally frequent. The close species *C. pumilum* Curtis, may also occur occasionally in dry lawns.
Chamomilla recutita (L.) Rauschert
H. Rare.
Chondrilla juncea L.
D (P). Occasional.
Convolvulus arvensis L.
P. Occasional.
Coronopus didymus (L.) Sm.
N. Common in B; Rare in Z.
Crepis bursifolia L.
N (D). Common in both cities.
C. vesicaria subsp. ***taraxacifolia*** (Thuill) Thell.
N. Occasional.
Cynodon dactylon (L.) Pers.
N (D). Common.
Cyperus rotundus L.
N. Common; persistent in both humid and dry lawns.
Dactylis glomerata L.
N. Occasional. Subsp. *glomerata* introduced; subsp. *hispanica* (Roth) Nyman, our native plant, sometimes present, especially in dry or poorly maintained lawns.
Desmazeria rigida (L.) Tutin
D. Frequent.
Dichondra micrantha Urb.
N. Common. Often sown, but self-sows too.
Digitaria sanguinalis (L.) Scop.
N. Common.
D. violascens Link
N (H). Frequent.
Eleusine tristachya subsp. ***barcinonensis*** (Willk.) A. & O. Bolòs
D. Rare; locally frequent in poorly maintained lawns.
Eragrostis barrelieri Daveau
P. Rare. Other *Eragrostis* spp. might rarely occur as adventives.
Erodium cicutarium (L.) L'Hér.
D. Occasional, locally frequent.
E. malacoides (L.) L'Hér.
P. Occasional.
E. moschatum (L.) L'Hér.
N. Occasional (local en Z).
Euphorbia prostrata Aiton
N. Common.
Euphorbia serpens Kunth
N (P). Frequent.
Festuca arundinacea Schreb. [*Schedonorus arundinaceus* (Schreb.) Dumort.]
N. Sown and spontaneous. Common.
F. ovina subsp. ***ophioliticola*** (Kerguélen) M. Wilk.
N. Only as a sown species, and then on a very small scale.

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F. rubra L. *s.l.*
N. Frequent. Usually as a sown species, producing a fine sward.
Galium murale (L.) All.
N. Prefers shade. Frequent in B; occasional in Z.
Gamochaeta coarctata (Willd.) Kerguélen
H. Occasional in B; rare in Z.
Geranium dissectum L.
W. Occasional in B; rare in Z.
G. molle L.
N (D). Common.
Gnaphalium luteoalbum L.
H (P). Occasional in B; rare in Z.
Hainardia cylindrica (Willd.) Greuter
N. Occasional (locally abundant).
Helminthotheca echioides (L.) Holub [*Picris echioides* L.]
N (P). Frequent in B; occasional in Z.
Hordeum murinum subsp. ***leporinum*** (Link) Arcang.
P. Frequent.
Hypochaeris radicata L.
N. Frequent; locally common.
Lolium perenne L.
N. Frequent. Sown, but also persisting and ± spontaneous in some places.
Lotus corniculatus L. (s.l.)
N. Common. The plant often abundant in lawns is a rather prostrate plant that departs somewhat from *L. corniculatus sensu stricto*.
L. tenuis Willd.
H (W). Occasional.
Malva neglecta Wallr.
N. Frequent in B; rare in Z.
M. parviflora L.
D. Frequent; in Z the most common mallow.
Medicago arabica (L.) Huds.
H. Occasional; rare in Z.
M. littoralis Rohde ex Loisel.
N (D). Occasional, locally frequent in both cities.
M. lupulina L.
N. Common.
M. minima (L.) L.
D. Common.
M. polymorpha L.
N. Common.
M. rigidula (L.) All.
N. Rare.
Melilotus indicus (L.) All.
N (D). Occasional to frequent.
M. officinalis (L.) Lam.
P. Occasional.
M. sulcatus Desf.
D. Rare, less so in Z.
Oenothera rosea L'Hér. ex Aiton
P. Rare. In Z only observed in lawns between Actur and Juslibol.
Oloptum miliaceum (L.) Röser & Hamasha [*Piptatherum miliaceum* (L.) Coss.]
N (D,P). Occasional.
Oxalis corniculata L.
N (D). Common.
Paspalum dilatatum Poir.
N. Frequent. A very persistent lawn grass weed.
P. distichum L.
W (H). Occasional; more frequent in Z.
P. notatum var. ***saurae*** Parodi [*P. saurae* (Parodi) Parodi]
N. Locally common in B; rare in Z.
Plantago coronopus L.
D. Common.
P. lagopus L.
D. Locally common in exposed, dry lawns.
P. lanceolata L.
N. Frequent.
P. major L.
N. Common.
Poa annua L. [*Ochlopoa annua* (L.) H. Scholz]
N (P). Common.
P. pratensis L.
N. Frequent. Sown species, but also native.
P. subcaerulea [*P. pratensis* subsp. *irrigata* (Lindm.) H. Lindb.]
N. Occasional. Locally frequent in B; rare in Z. A non-native species, introduced in lawnseed mixtures.
Polycarpon tetraphyllum (L.) L.
N (P). Frequent.
Polygonum aviculare L.
N. Frequent. A close species, *P. arenastrum* Boreau, generally avoids lawns.
Portulaca oleracea L. *s.l.*
N. Common. The most likely infraspecific taxon present is subsp. *granulatostellulata* (Poellnitz) Danin
Potentilla reptans L.
H. Occasional. Tolerates both wet and relatively dry conditions.
Prunella vulgaris L.
H. Occasional.
Ranunculus muricatus L.
H. Frequent.
R. repens L.
W. Occasional.
Sagina apetala subsp. ***erecta*** (Hornem.) F. Herm.
N. Frequent.
Salvia verbenaca L.
D (P). Rare.
Scorzonera laciniata L. [*Podospermum laciniatum* (L.) DC.]
N (P). Occasional.
Setaria adhaerens (Forssk.) Chiov.
N (P). Occasional in lawns, but a common urban weed.
S. glauca (L.) P. Beauv. [*S. pumila* (Poir.) Schult. & Schult. fil.]
H. Occasional, somewhat more frequent in Z.
S. parviflora (Poir.) Kerguélen
N (D). Occasional; rare in Z.
S. viridis (L.) P. Beauv.
N. Occasional.
Sherardia arvensis L.
N. Common.
Silene nocturna L.
N (P). Occasional.
Sisymbrium irio L.
P. Occasional; more frequent in Z.
Soleirolia soleirolii (Req.) Dandy
H. Shaded areas. Occasional in B; rare in Z.
Spergula bocconei (Scheele) Pederson [*Spergularia bocconei* Scheele]
D. Occasional, but locally abundant in poorly maintained lawns.
Sporobolus indicus (L.) R.Br.
N (D). Common.
Stellaria media (L.) Vill.
N. Frequent.
S. pallida (Dumort.) Piré
N. Frequent.
Stenotaphrum secundatum (Walter) O. Kuntze
H. Occasional. A usually planted grass capable of spreading beyond its limits.
Taraxacum *sect.* ***Taraxacum*** F.H. Wigg.
N (H). Frequent. No attempt has been made here to distinguish microspecies.
Torilis arvensis (Huds.) Link *s.l.*
P. Rare, except in newly-sown lawns.

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Torilis nodosa (L.) Gaertn.
N. Common.
Tribulus terrestris L.
D. Rare.
Trifolium campestre Schreb.
N. Frequent.
T. fragiferum L.
W (H). Frequent in humid lawns.
T. pratense L.
H. Occasional.
T. repens L.
N. Common, and often sown.
Verbena officinalis L.
N. Occasional.
Veronica arvensis L.
N. Common.
V. persica Poir.
N. Common.
V. polita Fr.
N (D). Common.
Vicia sativa subsp. ***nigra*** (L.) Ehrh.
N. Occasional.

2) Species encountered only in the lawns of **Barcelona** and adjacent areas.

Aetheorhiza bulbosa (L.) Cass. [*Sonchus bulbosus* (L.) N. Kilian & Greuter]
H. Apparently rare, though possibly overlooked.
Agrostis capillaris L.
N (D). Rare. A species sometimes sown, but it appears to be spontaneous here.
Bowlesia incana Ruiz & Pav.
N (P). Rare. See Discussion notes.
Cardamine hirsuta L.
H. Locally frequent.
Cenchrus clandestinus (Hochst. ex Chiov.) Morrone [*Kikuyuochloa clandestina* (Hochst. ex Chiov.) H. Scholz]
N (H, D) Common, and increasing at a fast rate. Probably sown initially. Detected in Zaragoza at the time of going to press.
C. longisetus M.C. Johnst. [*Pennisetum villosum* Fresen.]
D. Occasional.
Convolvulus althaeoides L.
P (D). Occasional.
Cotula australis (Sieber ex Spreng.) Hook. f.
N. Common.
Crepis sancta (L.) Bornm. [that of Babcock (1941) is an isonym]
N. Common.
Cyclospermum leptophyllum (Pers.) Sprague [*Apium leptophyllum* Pers.]
N. Frequent.
Diplotaxis muralis (L.) DC.
N. Rare.
Duchesnia indica (Jacks.) Focke [*Potentilla indica* (Jacks.) Th. Wolf]
N. Occasional. Frequent in La Ciutadella park.
Eleusine indica (L.) Gaertn.
N. Frequent.
Geranium pusillum L.
H. Occasional. Rather local, for example in Plaça Sara Bernhardt.
Hypochaeris radicata subsp. ***rocinensis*** M.Á. Ortiz & Talavera
H. Rare.
Juncus articulatus L.
W. Rare.
Lamium purpureum L.
H. Rare.
Leontodon tuberosum L.
N (P). Rare. Lawns on Montjuïc.
Lepidium draba L. [*Cardaria draba* (L.) Desv.]
N. Occasional.
Linaria arvensis (L.) Desf.
P. Rare.
Lobularia maritima (L.) Desv. [*Alyssum maritimum* (L.) Lam.]
D. Occasional.
Lotus ornithopodioides (L.)
N. Occasional.
Medicago truncatula Gaertn.
N. Rare.
Melilotus elegans Ser.
P. Rare.
M. neapolitana Ten. ex Guss.
P. Rare.
Nothoscordum nudicaule (Lehm.) Guagl.
N. Rare. *N.* x *borbonicum* Kunth is a common weed of disturbed or cultivated ground, but the species seen in rough lawns on Montjuïc is the one indicated here.
Ophrys apifera Huds.
P. Rare. Observed in a seldom-mown lawn on Montjuïc. Other species of this genus might occur occasionally in lawns.
Ornithogalum divergens Boreau
N. Rare. Two plants observed in lawns of La Gran Vía (L'Hospitalet).
Orobanche minor Sm.
P. Rare, and associated usually with *Hypochaeris radicata* or *Plantago* spp.
Paspalum vaginatum Swartz
H. Frequent. May either be sown intentionally, or appear as a naturalized species.
Poa maroccana Nannf. [*Ochlopoa maroccana* (Nannf.) H. Scholz]
N (P). Occasional. More likely to be seen in adjacent areas, such as tree pits.
Ranunculus parviflorus L.
N. Frequent.
R. sardous subsp. ***trilobus*** (Desf.) Rouy & Fouc.
W. Rare.
Reichardia picroides (L.) Roth
N. Occasional.
Scirpus litoralis (Schrad.) Palla
W. Rare. Observed in the lawns around Moll de la Fusta.
Scorpiurus subvillosus L. [*S. muricatus* L.]
D. Occasional.
Setaria verticilliformis Dumort. [*S. ambigua* (Guss.) Guss.]
H. Rare.
Soliva sessilis Ruiz & Pav. [*S. pterosperma* (Juss.) Less.]
N. Occasional. Locally abundant in lawns to the south of the city and in L'Hospitalet de Llobregat.
Trifolium nigrescens Viv.
N. Rare, but observed both in Barcelona and L'Hospitalet.
T. scabrum L.
D. Occasional.
T. subterraneum L.
N. Rare.
T. tomentosum L.
N. Occasional, locally frequent.
Urospermum dalechampii (L.) Scop. ex F.W. Schmidt
P. Occasional.
Zoysia matrella (L.) Mer.
N. Planted (turf sods) and spreading from where established.

3) Species encountered in lawns only in **Zaragoza** (Saragossa).

Agrostis castellana Boiss. & Reut.
D. Rare.
Allium paniculatum L.

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N. Frequent and confirmed in Z (unconfirmed at species level in B).

Aptenia cordifolia (L.fil.) Schwant.
P. Rare, and mainly on edges of green areas.

Bothriochloa ischaemum (L.) Keng
D. Occasional.

Centaurium pulchellum (Swartz) Druce
H. Occasional.

Cerastium fontanum subsp. ***vulgare*** (Hartm.) Greuter & Burdet
H. Rare.

Festuca stricta subsp. ***trachyphylla*** (Hack.) Patzke [*F. brevipila* Tracey]
N. Rare, and may have been introduced intentionally, originally, as a sown grass.

Glechoma hederacea L.
H. Rare, only observed in city centre lawns.

Kickxia spuria (L.) Dumort.
H. Rare. near Pavellón Príncipe Felipe.

Leontodon saxatilis Lam. [*Leontodon taraxacoides* (Vill.) Mérat]
H. Locally frequent in Z; presence unconfirmed in B.

Lythrum hyssopifolia L.
H (W). Rare in lawns between Actur and Juslibol.

Mentha pulegium L.
W. Rare.

Phleum pratense L.
H. Rare. Observed in Plaza Tenerias, where it may have originally been sown.

Pilosella capillata (Arv.-Touv.) Mateo
D. Occasional.

Plantago media L.
H. Rare in lawns in La Romareda district.

Poa compressa L.
N. Rare.

P. infirma Kunth [*Ochlopoa infirma* (Kunth) H. Scholz]
P. Occasional, more frequent in Rabal and Actur districts (Margen izquierda).

Tetragonolobus maritimus (L.) Roth [*Lotus maritimus* L.]
H. Rare.

Trifolium dubium Sibth.
H. Rare. Between Actur and Juslibol.

Tripleurospermum maritimum subsp. ***inodorum*** (L.) Appleq.
H. Rare.

Vicia parviflora Cav.
N. Rare. Actur norte.

V. sativa subsp. ***amphicarpa*** (L.) Batt.
D. Rare. Observed in Las Fuentes district.

Viola suavis Bieb.
H. Rare. Locally frequent in La Romareda – Universidad.

DISCUSSION, INCLUDING PREVIOUSLY UNRECORDED SPECIES

Regarding the frequency annotations, a more statistical method would undoubtedly complement this observational approach, but would be unlikely to contradict it in its basic conclusions. The Braun-Blanquet approach (BRAUN-BLANQUET, 1932), adapted to assess species cover-abundance in green areas of our towns and cities, could certainly be implemented, though it could well attract curious onlookers in the process. It consists of laying down quadrats (of varying or of equal sizes) along a line transect. Simple wooden framed quadrats can be used.

During the course of this study, several species without a previous mention in the region were recorded and duly published (PYKE, 2003a, b; 2008).

In addition, in 2011, another species, *Soliva sessilis* Ruiz & Pav., was detected in lawns in the south-west of the city of Barcelona, where it is apparently on the increase (PYKE, 2013). The species of *Soliva* spread by means of their spine-tipped fruit, and the nodular roots along their prostrate stems. This plant, to my knowledge, had not been reported from Catalonia until 2013. At the time of this present article's going to press, it has spread considerably and is now to be found in many green areas of both Barcelona and L'Hospitalet. The fruit is a nuisance to dogs, as it can attach itself to their paws, thus helping in the dispersal of the species.

An unusual umbelliferous weed, observed since the spring of 2013, is also well adapted to lawn conditions. I am referring to *Bowlesia incana* Ruiz & Pav., a low-growing or prostrate annual from America. The population observed appears to be a first record for Catalonia. Although specimens have been collected and conserved in BC since its discovery, no publication has been made confirming its presence in the region until now.

Poa maroccana is another plant, an annual grass, that needs to be formally recognised here, since it is a poorly known and collected species, cited from the Iberian Peninsula in 1967 by H. Scholz (HERNÁNDEZ CARDONA, 1976) but largely ignored since then. The author has collected it on several occasions, and herbarium sheets can be consulted in Barcelona (BC). It is an autopolyploid, based on *P. infirma*, and is present in Barcelona, L'Hospitalet de Llobregat and further south, more often in street tree pits (*alcorques*) but also in bare patches in lawns. Pure stands of *P. infirma* are locally frequent in Zaragoza, but in Barcelona it appears to be rare, absent from lawns, its place being taken by *P. maroccana*.

Hypochaeris radicata subsp. *rocinensis* was described in *Acta Botanica Malacitana* (TALAVERA & al., 2015), with a distribution, at the time of publication, limited to Andalucía. It is an interesting taxon, the most distinguishing features being its horizontal stoloniferous root system and narrower, glabrous or glabrescent leaves. We can expect further new localities along the West Mediterranean coasts, perhaps in the low-lying coastal areas of Valencia and the Ebro delta. It seems to prefer humid, slightly saline places, and tolerates lawn conditions despite the frequent cutting. Horizontal vegetative propagation compensates for the loss of scapes on mowing. This record is new for Catalonia.

Wet places, such as those where a permanent fault in the irrigation system results in very humid conditions, favour certain species otherwise absent from better kept lawns. Such species include *Apium nodiflorum, Ranunculus repens* and rushes (in Barcelona, *Scirpus litoralis* and *Juncus articulatus* have been observed). When *Phragmites* appears, there is reason to suspect the rupture of a deep tube, or a natural subterranean watercourse.

Strongly dominant species can displace the sown grasses within a few years. The kikuyu grass must be considered here; if it is not intended to constitute the sward, it needs to be studiously eliminated, since it is an extremely aggressive species in the coastal region. Other grass species considered undesirable are *Paspalum dilatatum* and *P. notatum* var. *saurae,* these present in both cities.

Rarely seen is the parasitic *Orobanche minor*, which in lawns shows a preference for composite species, especially *Hypochaeris radicata* and, to a lesser extent, for *Plantago coronopus*.

Comparing the floral composition of continental Zaragoza and coastal Barcelona we can see that, in general, the same non-sown species are common to both cities, this being due to similar municipal maintenance practices. Some differences can be observed, however, and these are mentioned below.

Although Zaragoza lies within an area of scarce precipitation, its semi-arid climate having an average of below 400 mm of rain per year, lawn irrigation systems compensate for this lack of water, and explain the presence and relative permanence of such plants as *Cerastium fontanum* subsp. *vulgare*, *Glechoma hederacea*, *Plantago media, Leontodon saxatilis* or *Phleum pratense*. Few species with a marked continentality preference stand out. Of those not also observed in Barcelona's lawns, *Vicia sativa* subsp. *amphicarpa*, *Pilosella capitata*, *Agrostis castellana* and *Poa compressa* can be mentioned. The vegetation beyond the built-up area is, of course, markedly different from that of the more humid coastal areas around Barcelona.

Regarding the species present in the Barcelona area but not observed in the lawns of Zaragoza, we can see a good number of species that require a mild climate, and prefer the coastal regions of the Iberian Peninsula. Such species are *Ranunculus parviflorus*, *Diplotaxis muralis*, *Melilotus elegans*, *M. neapolitana*, *Trifolium nigrescens*, *Lotus ornithopodioides*, *Geranium pusillum*, *Convolvulus althaeoides*, *Reichardia picroides*, *Urospermum dalechampii* and *Scirpus litoralis*. *Crepis sancta*, also, is much more abundant in the coastal, as opposed to interior regions of the peninsula. *Leontodon tuberosum* has only been observed in Barcelona. *Aetheorrhiza* (*Crepis*) *bulbosa*, although normally considered a coastal species, is also found in the Ebro Valley around the Aragonese capital, but no observations have been recorded from Zaragoza's urban areas.

Focusing on introduced species, it is not always clear whether the cold winters of Zaragoza prevent some of these from becoming established or whether they have simply not yet arrived in the Aragonese capital. This may be the case of *Cenchrus clandestinus*, for example, which was observed there for the first time in October 2021. *Cotula australis* has been recorded from Zaragoza, but only as a casual, and not in lawns; in Barcelona, however, it is an abundant species in lawns and between paving stones.

The following introduced species (not present in Zaragoza) also appear with varying frequency in the lawns of the Catalonian capital: *Duchesnia indica, Bowlesia incana, Cyclospermum leptophyllum, Soliva sessilis, Cenchrus longisetus, Eleusine indica* and *Paspalum vaginatum.*

The families represented, following the Angiosperm Phylogeny Group (APG) recommendations here, reveal a predominance of three: *Poaceae* (38), *Fabaceae* (30) and *Asteraceae* (22), these being principal families also in other habitats in the Mediterranean Basin. Other families significantly represented are: *Plantaginaceae* (10), *Caryophyllaceae* (9), *Geraniaceae* (7), *Brassicaceae* (6), *Lamiaceae* (5) and *Apiaceae* (5).

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APPENDIX

Specimens deposited in herbarium BC (*Institut Botànic de Barcelona*) which constitute records of interest in relation to this article, and have not been cited previously. Grid references refer to the UTM system.

Bowlesia incana

BARCELONA: 31TDF2779, L'Hospitalet de Llobregat, Santa Eulàlia, céspedes cerca de la *Ciutat de la Justícia*, 10 m, 12/06/2013, SBP6808 (BC 878719); idem., 3/04/2017, SBP7420 (BC 970844).

Hypochaeris radicata subsp. rocinensis

BARCELONA: 31TDF2779, Barcelona: césped al lado de plaza Cerdà, en el paseo de la Zona Franca, 10 m, 6/09/2021, SBP7929 (BC 983105).

Soliva sessilis (see also records published in 2013)

BARCELONA: 31TDF2879, Barcelona, Montjuïc, c/ Foc, 30 m, 12/05/2016, SBP7274 (BC 956060). 31TDF2879, idem., Montjuïc, Polvorín, 60 m, 30/04/2017, SBP7429 (BC 970753). 31TDF2778, L'Hospitalet de Llobregat, glorieta al lado de Jardín Gran Vía, 10 m, 18/04/2021, SBP7891 (BC 983106).

Poa maroccana

BARCELONA: 31TDF0867, Sitges: Garraf, pueblo, 10 m, 2/04/2021, SBP6717 (BC928019). 31TDF2778, L'Hospitalet de Llobregat, Gran Vía Sur, 10 m, SBP6902 (BC940161). 31TDF2678, idem., 10 m, 4/04/2021, SBP7888 (BC983107).

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