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Inventory Of The Urban Flora Of The City Of Kénitra (Morocco)

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Abstract

The city of Kenitra is located on the south shore of Oued Sebou in a sub-humid bioclimatic atmosphere with a moderate winter. The soil is generally sandy clay on the side of the Mamora and sandy on sandstone substrate to the west, when it is not concrete. It is a city polluted by the many factories that it hosts. The census of urban vascular flora could be used to propose a land management strategy adapted to the context of the city of Kenitra. For this,the urban area was sampled systematically by following the alleys, streets and boulevards throughout the city. The samples collected were identified in the laboratory.The results of this identification made it possible to establish a list of 178 species affiliated to 152 genera and 64 families. The richest family in species is the Asteraceae (27 species), followed by that of the Fabaceae (13 species), the Poaceae (12 species), and the Lamiaceae (8 species). Therophytes are the most represented (77 species), followed by hemicryptophytes with 29 species, phanerophytes (24 species), Chamaephytes (19 species), nanophanerophytes (16 species), geophytes (10 species), and mesophanerophytes (3 species). It is rich and diverse vegetation that effectively contributes to the decontamination of the city by recycling the carbon dioxide released into the atmosphere and reducing the effect of heat islands created by increasing urban planning.

Keywords: Inventory, Vegetation, Decontamination, species,vascular flora, Kenitra.

Introduction

The city requires its originality from its natural limits which are the Sebou river to the north, the Fouarat Lake to the east, the Mamora forest to the south and southwest, and the Sidi Boughaba Lake as well as the Atlantic coast to the east. It is unfortunately well was polluted by the many factories it hosts; it is the fourth industrial city in the country. The study of the urban vegetation of this city is therefore well justified. This vegetation can effectively contribute to attenuating CO2 gas concentrations thanks to the phenomenon of carbon sequestration by photosynthesis mechanisms. It also participates in the attenuation of heat islands, in the humidification of the air and its oxygenation as well as in the improvement of the infiltration of rainwater whose surface runoff can cause increases in the water level water in the urban perimeter.

We consider that one of the important steps that will facilitate the proposal of a land management strategy, adapted to the context of the city, would be first to carry out an inventory of the urban vegetation. This is the objective of our study.

Materials and methods

Study zone

The city of Kenitra in (Figure 1), reaches over an area of 76 km² (Anonymous, 2019), is located in the Gharb lowland on the Atlantic coast between Rabat in the south, Sidi Kacem in the north and Sidi Allal El Bahraoui in the East. According to Emberger's climagram (1955), the bioclimate is the type of Mediterranean, subhumid to temperate to cool on the coast. The city of Kenitra forms with the Mamora a single hydrogeological system, except that the impermeable substratum of the Mamora is shallower than that of the city (HCP, 2008). The soil in the area is generally sandy clay on the cork grove side and sandy on sandstone substrate in the west when it is not concrete.

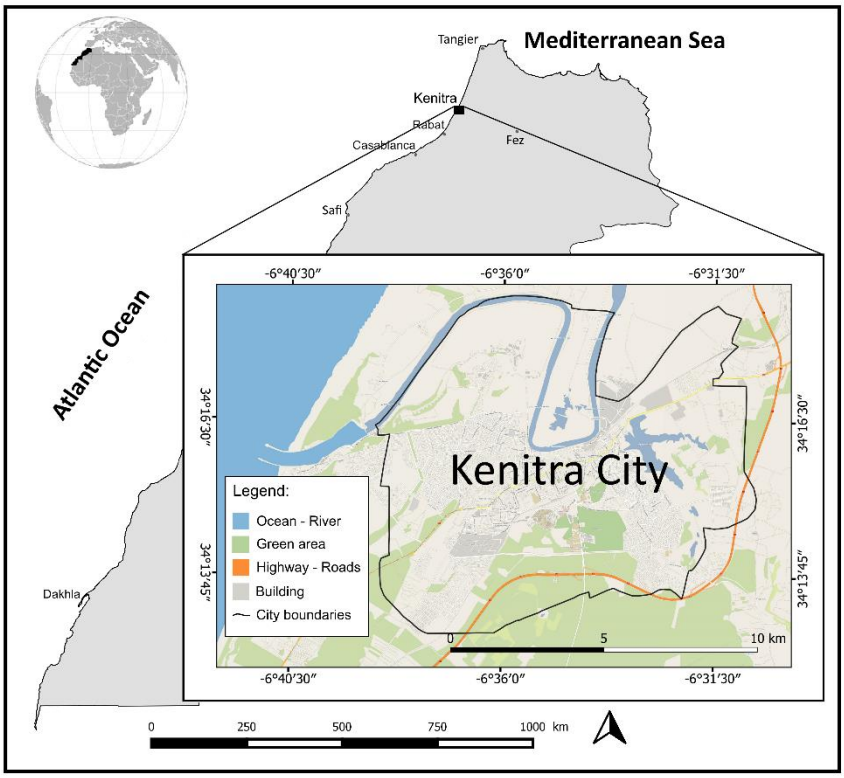

Figure 1. Location map of the city of Kénitra (Google maps, 2021, modified by ourselves)

Sampling

The sampling adopted is systematic by following 35 alleys and 30 streets as well as 15 boulevards in the city of Kenitra (Figure 2). Each plant encountered is collected for identification. The streets prospected in their micro and macro habitats. The herbaceous plants were taken entirely, and only flowering or fruiting twigs were cut from the shrubs and trees. As an illustration, the samples collected, photos were taken in situ.

The plants observed in the urban environment are ornamental and spontaneous species. The sampling was carried out during the period spread over autumn 2016, winter 2016/2017, spring, and

summer 2017 to establish the most exhaustive possible list of the urban vegetation of the city of Kenitra.

The ruderal was determined using the practical flora of Morocco (Fennane et al., 1999), (Fennane et al., 2007) and (Fennane et al., 2014), that of ornamental plants was performed using websites such as Telabotanica, Wikipedia, Ooreka, Hortipedia, Au Jardin Info, PlantUse and Rustica.

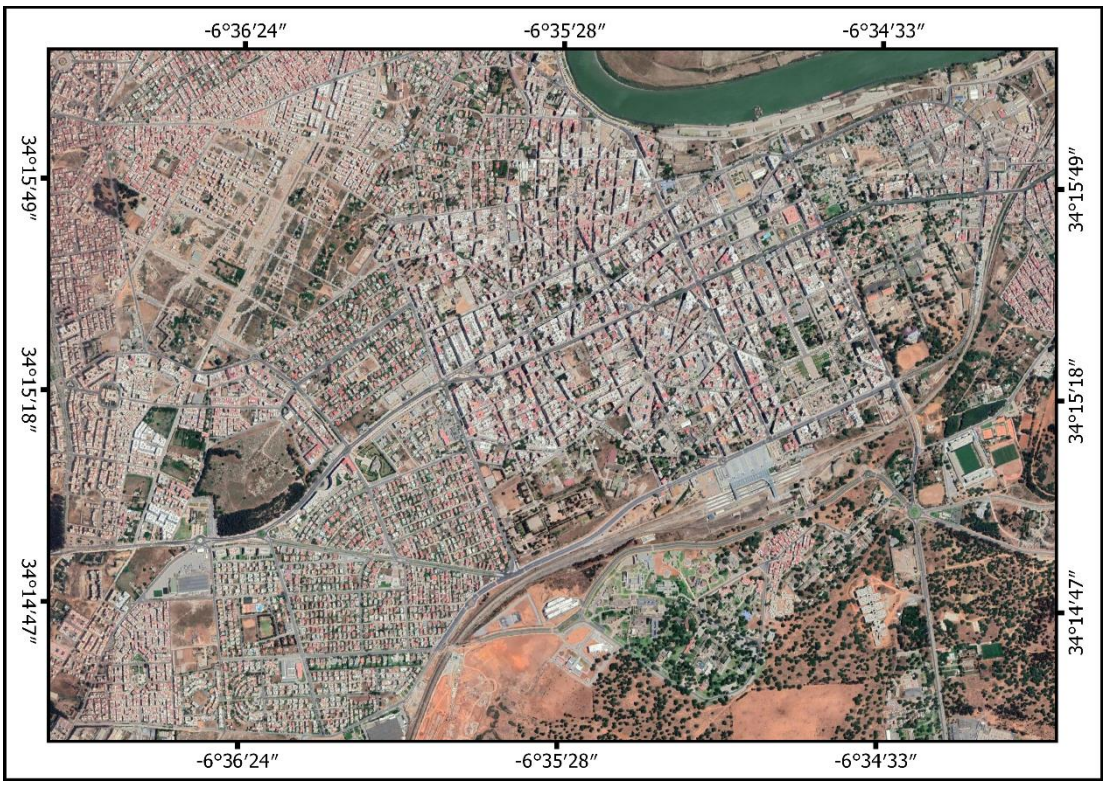

Figure 2. Screenshot of the city of Kenitra from google earth (2019)

The samples collected were mounted into a herbarium that we keep as the first database. Once established, the list of plant species in the city of Kenitra was subjected to a floristic analysis to determine the richness-specific, generic, and botanical families of the city's vegetation. Graphical representations have been established showing the specific richness by botanical family, by biological type, and by native status.

Results

The identification of the samples collected made it possible to draw up the list of plant species encountered in the city of Kenitra, which we present by family, biological type and status in alphabetical order (Table 1).

Regarding Phanerophytes whose first renovation buds appear more than 30 cm above the ground (Raunkiaer, 1935), three categories will be distinguished:

- The phanerophytes, arborescent plants
- The mesophanerophytes, tall shrub plants
- The nanophanerophytes, low shrub plants

Table 1. The species that make up the urban flora of the city of Kenitra by family, biological type, and indigenous status.

Family	Type	Species	Biological type	Status
AGAVACEAE	Agave	Agave americanaL.	Hemicryptophyte	Naturalized
AIZOACEAE	Aptenia	Apteniacordifolia(L.F.) Schwantes	Chamaephyte	Ornamental
AIZOACEAE	Carpobrotus	Carpobrotus edulis(L.) N.E.Br.	Chamaephyte	Naturalized
AMARANTHACEAE	Achyranthes	AchyranthesasperaL.	Chamaephyte	Spontaneous
AMARANTHACEAE	Amaranthus	Amaranthusretroflexus L.	Therophyte	Spontaneous
AMARANTHACEAE	Atriplex	AtriplexhalimusL.	Nanophanerophyte	Spontaneous
AMARANTHACEAE	Chenopodium	Chenopodiumambrosoides(L.) Mosyakin & Clemants	Therophyte	Spontaneous
ANACARDIACEAE	Schinus	Schinus terebenthifolius Raddi.	Phanerophyte	Introduced
APIACEAE	Ammi	Ammi majus L.	Therophyte	Spontaneous
APOCYNACEAE	Asclepias	Asclepias curassavica L.	Chamaephyte	Naturalized
APOCYNACEAE	Catharanthus	Catharanthus roseus (L.) G.Don	Chamaephyte	Introduced
APOCYNACEAE	Nerium	Nerium oleander L.	Nanophanerophyte	Spontaneous
ARACEAE	Arisarum	Arisarum vulgare Targ.Tozz	Geophyte	Spontaneous
ARACEAE	Syngonium	Syngonium podophyllum	Chamaephyte	Introduced
ARALIACEAE	Hedera	Hedera helix L.	Phanerophyte	Spontaneous
ARAUCARIACEAE	Araucaria	Araucaria heterophylla (Salisb.) Franco	Phanerophyte	Introduced
ARECACEAE	Chamaerops	Chamaerops humilis L.	Nanophanerophyte	Spontaneous
ARECACEAE	Phoenix	Phoenix canariensis Hort. ex Chabaud	Phanerophyte	SubSpontaneous
ASPARAGACEAE	Asparagus	Asparagus setaceus (Kunth) Jessop	Chamaephyte	Introduced
ASPARAGACEAE	Sansevieria	Sansevieria trifasciata Prain.	Hemicryptophyte	Introduced
ASPHODELACEAE	Aloe	Aloe vera (L.) Burm.f.	Hemicryptophyte	Introduced
ASTERACEAE	Anacyclus	Anacyclus radiatus Loisel	Therophyte	Spontaneous
ASTERACEAE	Andryala	Andryala integrifolia L.	Hemicryptophyte	Spontaneous
ASTERACEAE	Arctotheca	Arctotheca calendula (L.) Levyns	Therophyte	Naturalized
ASTERACEAE	Argyranthemum	Argyranthemum foeniculaceum Webb ex Sch.Bip.	Therophyte	Introduced
ASTERACEAE	Argyranthemum	Argyranthemum frutescens (L.) Sch.Bip.	Chamaephyte	Introduced
ASTERACEAE	Bellis	Bellis sylvestris L.	Hemicryptophyte	Spontaneous
ASTERACEAE	Farfugium	Farfugium japonicum (L.) Kitam.	Geophyte	Introduced
ASTERACEAE	Calendula	Calendula arvensis M.Bieb.,	Therophyte	Spontaneous
ASTERACEAE	Carduus	Carduus pycnocephalus L.	Therophyte	Spontaneous
ASTERACEAE	Carlina	Carlina racemosa L.	Therophyte	Spontaneous
ASTERACEAE	Centaurea	Centaurea calcitrapa L.	Hemicryptophyte	Naturalized
ASTERACEAE	Centaurea	Centaurea pullata L.	Hemicryptophyte	Spontaneous
ASTERACEAE	Dittrichia	Dittrichia viscosa (L.) Greuter	Chamaephyte	Spontaneous

ASTERACEAE	Erigeron	Erigeron bonariensis L.	Therophyte	Naturalized
ASTERACEAE	Galactites	Galactites tomentosus Moench	Therophyte	Spontaneous
ASTERACEAE	Gazania	Gazania rigens (L.) Gaertn.	Hemicryptophyte	Introduced
ASTERACEAE	Leontodon	Leontodon saxatilis Lam.	Hemicryptophyte	Spontaneous
ASTERACEAE	Osteospermum	Osteospermum ecklonis (DC.)Norl.	Chamaephyte	Introduced
ASTERACEAE	Santolina	Santolina chamaecyparissus L.	Chamaephyte	Introduced
ASTERACEAE	Scolymus	Scolymus hispanicus L.	Hemicryptophyte	Spontaneous
ASTERACEAE	Senecio	Senecio vulgaris L.	Therophyte	Spontaneous
ASTERACEAE	Sonchus	Sonchus oleraceus L.	Therophyte	Spontaneous
ASTERACEAE	Sylibum	Sylibum marianum (L.) Gaertn.	Hemicryptophyte	SubSpontaneous
ASTERACEAE	Tagetes	Tagetes minuta L.	Therophyte	Spontaneous
ASTERACEAE	Tagetes	Tagetes patula L.	Therophyte	Introduced
ASTERACEAE	Verbesina	Verbesina encelioides (Cav.) Benth. &Hook.f. ex A.Gray	Therophyte	Naturalized
ASTERACEAE	Xantium	Xantium spinosum L.	Therophyte	Naturalized
BIGNONIACEAE	Jacaranda	Jacaranda mimosifolia D.Don	Phanerophyte	Introduced
BIGNONIACEAE	Podranea	Podranea ricasoliana (Tanfanl) Sprqgue	Phanerophyte	Introduced
BIGNONIACEAE	Tecoma	Tecoma capensis (Thunb.) Lindl.,	Nanophanerophyte	Introduced
BORAGINACEAE	Cynoglossum	Cynoglossum creticum Mill.	Therophyte	Spontaneous
BORAGINACEAE	Echium	Echium plantagineum L.	Hemicryptophyte	Spontaneous
BORAGINACEAE	Heliotropium	Heliotropium europeum L.	Therophyte	Naturalized
BORAGINACEAE	Cerinthe	Cerinthe major L.	Therophyte	Spontaneous
BRASSICACEAE	Capsella	Capsella bursa pastoris (L.) Medik.	Therophyte	Spontaneous
BRASSICACEAE	Diplotaxis	Diplotaxis catholica L.	Therophyte	Spontaneous
BRASSICACEAE	Labularia	Labularia maritima (L.) Desv.	Chamaephyte	Spontaneous
BRASSICACEAE	Raphanus	Raphanus raphanistrum L.	Therophyte	Spontaneous
BRASSICACEAE	Sinapis	Sinapis alba L.	Therophyte	Spontaneous
BRASSICACEAE	Sisymbrium	Sisymbrium irio L.	Therophyte	Spontaneous
CACTACEAE	Opuntia	Opuntia ficus indica (L.) Mill.	Nanophanerophyte	Naturalized
CAPRIFOLIACEAE	Fedia	Fedia cornucopiae (L.) Gaertn.	Therophyte	Spontaneous
CARYOPHYLLACEAE	Cerastium	Cerastium glomeratum Thuill.	Therophyte	Spontaneous
CARYOPHYLLACEAE	Silene	Silene gallica L.	Therophyte	Spontaneous
CARYOPHYLLACEAE	Silene	Silene nocturna L.	Therophyte	Spontaneous
CARYOPHYLLACEAE	Silene	Silene vulgaris (Moench) Garcke	Geophyte	Spontaneous
CARYOPHYLLACEAE	Spergula	Spergula arvensis L.	Therophyte	Spontaneous
CARYOPHYLLACEAE	Stellaria	Stellaria media (L.) Vill.,	Therophyte	Spontaneous
COMMELINACEAE	Tradescantia	Tradescantia zebrina (Schinz) D. R. Hunt	Hemicryptophyte	Introduced

COMMELINACEAE	Tradescantia	Tradescantia pallida (Rose) D.R.Hunt	Hemicryptophyte	Introduced
CONVOLVULACEAE	Convolvulus	Convolvulus arvensis L.	Geophyte	Spontaneous
CRASSULACEAE	Cotyledon	Cotyledon obriculata L.	Hemicryptophyte	Ornamental
CRASSULACEAE	Crassula	Crassula multicava Lemaire.	Chamaephyte	Introduced
CUPRESSACEAE	Cupressus	Cupressus Sempervirens L.	Phanerophyte	Introduced
CYPERACEAE	Cyperus	Cyperus papyrus L.	Geophyte	Introduced
CYPERACEAE	Cyperus	Cyperus rotundus L.	Geophyte	Spontaneous
DIPSACACEAE	Sixalix	Sixalix atropurpurea var. maritima L.	Hemicryptophyte	Spontaneous
EUPHORBIACEAE	Euphorbia	Euphorbia cotinifolia L.	Phanerophyte	Introduced
EUPHORBIACEAE	Euphorbia	Euphorbia helioscopia L.	Therophyte	Spontaneous
EUPHORBIACEAE	Euphorbia	Euphorbia milii Des Moul.	Nanophanerophyte	Introduced
EUPHORBIACEAE	Euphorbia	Euphorbia peplis L.	Therophyte	Introduced
EUPHORBIACEAE	Euphorbia	Euphorbia terracina L.	Therophyte	Spontaneous
EUPHORBIACEAE	Mercurialis	Mercurialis annua L.	Therophyte	Spontaneous
EUPHORBIACEAE	Ricinus	Ricinus communis L.	Nanophanerophyte	Naturalized
FABACEAE	Acacia	Acacia horrida (L.) Willd.	MesoPhanerophyte	Introduced
FABACEAE	Acacia	Acacia mollissima Willd.	Phanerophyte	Introduced
FABACEAE	Ceratonia	Ceratonia siliqua L.	Phanerophyte	Spontaneous
FABACEAE	Lupinus	Lupinus luteus L.	Therophyte	Spontaneous
FABACEAE	Lupinus	Lupinus micranthus Guss.	Therophyte	Spontaneous
FABACEAE	Medicago	Medicago polymorpha L.	Therophyte	Spontaneous
FABACEAE	Melilotus	Melilotus indicus (L.) All.	Therophyte	Spontaneous
FABACEAE	Ononis	Ononis reclinata L.	Therophyte	Spontaneous
FABACEAE	Trifolium	Trifolium campestre Schreb.	Therophyte	Spontaneous
FABACEAE	Trifolium	Trifolium resupinatum L.	Therophyte	Spontaneous
FABACEAE	Vicia	Vicia lutea L.	Therophyte	Spontaneous
FABACEAE	Vicia	Vicia monantha Retz.	Therophyte	Spontaneous
FABACEAE	Vicia	Vicia sativa L.	Therophyte	Spontaneous
FAGACEAE	Quercus	Quercus suber L.	Phanerophyte	Spontaneous
GERANIACEAE	Erodium	Erodium cicutarium(L.) L'Hér. ex Aiton	Therophyte	Spontaneous
GERANIACEAE	Geranium	Geranium robertianum L.	Therophyte	Spontaneous
GERANIACEAE	Geranium	Geranium molle L.	Therophyte	Spontaneous
GERANIACEAE	Pélargonium	Pélargonium graveolens L'Hér.	Chamaephyte	Introduced
LAMIACEAE	Lamium	Lamium amplexicaule L.	Therophyte	Spontaneous
LAMIACEAE	Marrubium	Marrubium vulgare L.	Hemicryptophyte	Spontaneous
LAMIACEAE	Mentha	Mentha pulegium L.	Hemicryptophyte	Spontaneous
LAMIACEAE	Ocimum	Ocimum basilicum L.	Therophyte	Ornamental
LAMIACEAE	Plectranthus	Plectranthus	Hemicryptophyte	Ornamental

		scutellarioides(L.) R.Br.		
LAMIACEAE	Rosmarinus	Rosmarinus officinalis L.	Nanophanerophyte	Spontaneous
LAMIACEAE	Salvia	Salvia officinalis L.	Chamaephyte	Introduced
LAMIACEAE	Salvia	Salvia verbenaceae L.	Hemicryptophyte	Spontaneous
LAURACEAE	Persea	Persea americana Mill.	Phanerophyte	Introduced
LINACEAE	Linum	Linum usitatissimum L.	Therophyte	Spontaneous
MALVACEAE	Brachychiton	Brachychiton populneus (Schott & Endl.) R,Br.	Phanerophyte	Introduced
MALVACEAE	Hibiscus	Hibiscus rosa sinensis L.	Nanophanéropyte	Introduced
MALVACEAE	Malva	Malva sylvestris L.	Hemicryptophyte	Spontaneous
MELIACEAE	Melia	Melia azedarach L.	Phanerophyte	Introduced
MORACEAE	Ficus	Ficus benjamina L.	Nanophanéropyte	Introduced
MORACEAE	Ficus	Ficus Carica L.	Phanerophyte	Ornamental
MORACEAE	Morus	Morus nigra L.	Phanerophyte	SubSpontaneous
MYRTACEAE	Eucalyptus	Eucalyptus camaldulensisDehnh.	Phanerophyte	Introduced
MYRTACEAE	Callistemon	Callistemon citrinus(Curtis) Skeels	Phanerophyte	Introduced
MYRSINACEAE	Anagallis	Anagallis arvensis(L.) U.Manns & Anderb.	Therophyte	Spontaneous
NYCTAGINACEAE	Bougainvillea	Bougainvillea spectabilis Willd.	Phanerophyte	Introduced
NYCTAGINACEAE	Mirabilis	Mirabilis jalapa L.	Hemicryptophyte	Introduced
OLEACEAE	Olea	Olea europaea L.	MesoPhanerophyte	Ornamental
OLEACEAE	Jasminum	Jasminum grandiflorum L.	Nanophanéropyte	Introduced
OLEACEAE	Jasminum	Jasminum mesnyiHance	Nanophanéropyte	Introduced
OROBANCHACEAE	Parentucellia	Parentucellia viscosa (L.) Caruel	Therophyte	Spontaneous
OXALIDACEAE	Oxalis	Oxalis corniculata Linnaeus	Therophyte	Spontaneous
OXALIDACEAE	Oxalis	Oxalis pes-caprae L.	Geophyte	Naturalized
PAPAVERACEAE	Fumaria	Fumaria capreolata L.	Therophyte	Spontaneous
PAPAVERACEAE	Fumaria	Fumaria rupestris Bolss & Reut	Therophyte	Spontaneous
PAPAVERACEAE	Glaucium	Glaucium flavum Crantz	Hemicryptophyte	Spontaneous
PAPAVERACEAE	Papaver	Papaver rhoeas L.	Therophyte	Spontaneous
PINACEAE	Pinus	Pinus halepensisMill.	Phanerophyte	Spontaneous
PLANTAGINACEAE	Misopates	Misopates orontium (L.) Raf.	Therophyte	Spontaneous
PLANTAGINACEAE	Plantago	Plantago lagopus L.	Therophyte	Spontaneous
PLANTAGINACEAE	Veronica	Veronica persica Poir.	Therophyte	Naturalized
PLATANACEAE	Platanus	Platanus acerifolia (Aiton) Willd.	Phanerophyte	Introduced
PLUMBOGINACEAE	Plumbago	Plumbago europaea L.	Chamaephyte	Spontaneous
POACEAE	Anisantha	Anisantha sterilis (L.) Nevski	Therophyte	Spontaneous
POACEAE	Arundo	Arundo donax L.	Geophyte	Ornamental
POACEAE	Avena	Avena sterilis L.	Therophyte	Spontaneous
POACEAE	Bromus	Bromus hordeaceus L.	Therophyte	Spontaneous

POACEAE	Cynodon	Cynodon dactylon **(L.) Pers.**	Geophyte	Spontaneous
POACEAE	Hordeum	Hordeum murinum L.	Hemicryptophyte	Spontaneous
POACEAE	Lagurus	Lagurus ovatus L.	Therophyte	Spontaneous
POACEAE	Lamarckia	Lamarckia aurea (L.) Moench	Therophyte	Spontaneous
POACEAE	Lolium	Lolium multiflorum Lam.	Therophyte	Spontaneous
POACEAE	Miscanthus	Miscanthus sinensisAndersson	Therophyte	Introduced
POACEAE	Poa	Poa annua L.	Therophyte	Spontaneous
POACEAE	Setaria	Setaria verticillata (L.) P.Beauv.	Therophyte	Spontaneous
POLYGALACEAE	Polygala	Polygala myrtifolia L.	Nanophanerophyte	Introduced
POLYGONACEAE	Emex	Emex spinosa (L.) P.Beauv.	Therophyte	Spontaneous
POLYPODIACEAE	Polypodium	Polypodium virginianum L.	Hemicryptophyte	Introduced
PORTULACACEAE	Portulaca	Portulaca oleraceae L.	Therophyte	Spontaneous
PROTEACEAE	Grevillea	Grevillea robusta A.Cunn. ex R.Br.	Phanerophyte	Introduced
RANUNCULACEAE	Ranunculus	Ranunculus peltatus Schrank	Hemicryptophyte	Spontaneous
RANUNCULACEAE	Ranunculus	Ranunculus muricatus L.	Therophyte	Spontaneous
ROSACEAE	Eriobotrya	Eriobotrya japonica (Thunb.) Lindl.	Phanerophyte	Introduced
RUBIACEAE	Galium	Galium aparine L.	Therophyte	Spontaneous
RUBIACEAE	Galium	Galium verrucosum Huds.	Therophyte	Spontaneous
RUTACEAE	Citrus	Citrus aurantium L.	Phanerophyte	Introduced
RUTACEAE	Citrus	Citrus limon (L.) Burm. f.	Phanerophyte	Ornamental
RUTACEAE	Ruta	Ruta graveolens L.	Chamaephyte	Introduced
SCROPHULARIACEAE	Verbascum	Verbascum sinuatum L.	Therophyte	Spontaneous
SOLANACEAE	Hyoscyamus	Hyoscyamus albus L.	Therophyte	Spontaneous
SOLANACEAE	Nicotiana	Nicotiana glauca Graham	Nanophanerophyte	Naturalized
SOLANACEAE	Salpichroa	Salpichroa origanifolia (Lam.) Baill.	Hemicryptophyte	Naturalized
SOLANACEAE	Solanum	Solanum elaeagnifolium Cav.	Chamaephyte	Naturalized
SOLANACEAE	Solanum	Solanum sodomaeum L.	Nanophanerophyte	Naturalized
STRELITZIACEAE	Strelitzia	Strelitzia reginae Aiton	Hemicryptophyte	Introduced
URTICACEAE	Urtica	Urtica dioica L.	Geophyte	Spontaneous
VERBENACEAE	Lantana	Lantana camara L.	Nanophanerophyte	Ornamental
VITACEAE	Vitis	Vitis vinifera L.	MesoPhanerophyte	Ornamental
XANTHORRHOEACEAE	Aloe	Aloe arborescens Mill.	Hemicryptophyte	Introduced
ZYGOPHYLLACEAE	Tribulus	Tribulus terrestris L.	Therophyte	Spontaneous

The use of the data in the above table made it possible to draw up the Figures 3, 4, and 5 which illustrate the variation in specific richness in terms of the families identified, the biological type, and the status of the indigenous population.

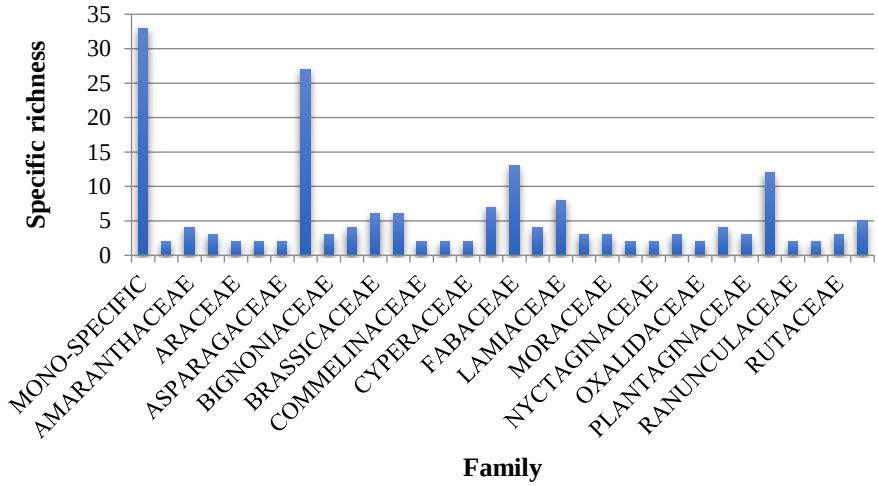

Figure 3. Representation of specific richness by family

In Figure 3, only the families which are represented by 2 species and more are visualized. The mono-specific families are: Agavaceae, Anacardiaceae, Apiaceae, Araliaceae, Araucariaceae, Asphodelaceae, Cactaceae, Caprifoliaceae, Convolvulaceae, Cupressaceae, Dipsacaceae, Fagaceae, Lauraceae, Linaceae, Meliaceae, Orobancinaceae, Polumbancinaceae, Polyumbacinaceae, Meliaceae, Orobancinacaceae, Linaceae, Meliaceae, Orobancinaceae, Plumbancacaceae, Meliaceae, Orobancinaceae, Plumbancacaceae, Meliaceae, Plumbancacaceae, Plumbanchaceae, Meliaceae , Polypodiaceae, Portulacaceae, Proteaceae, Rosaceae, Scrophulariaceae, Strelitziaceae, Urticaceae, Verbenaceae, Xanthorrhoeaceae and Zygophyllaceae.

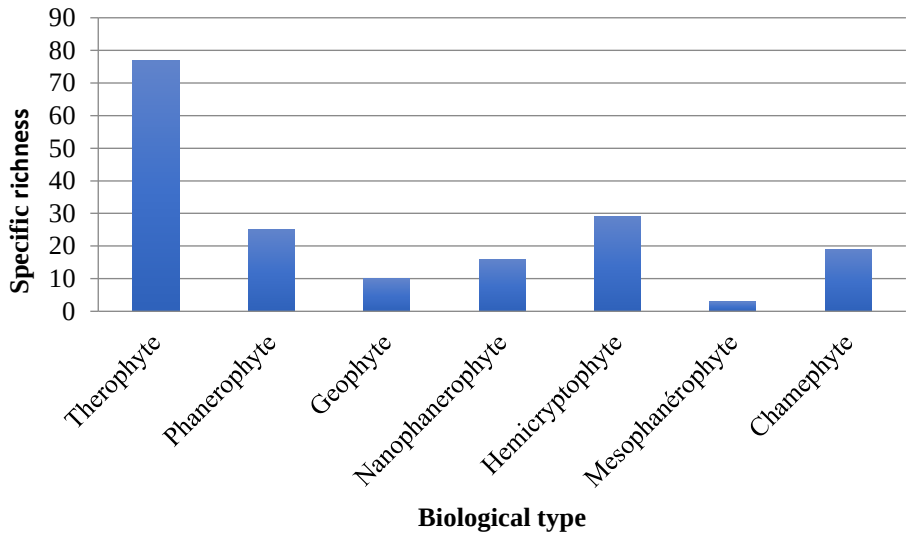

Figure 4. Representation of specific richness by biological type

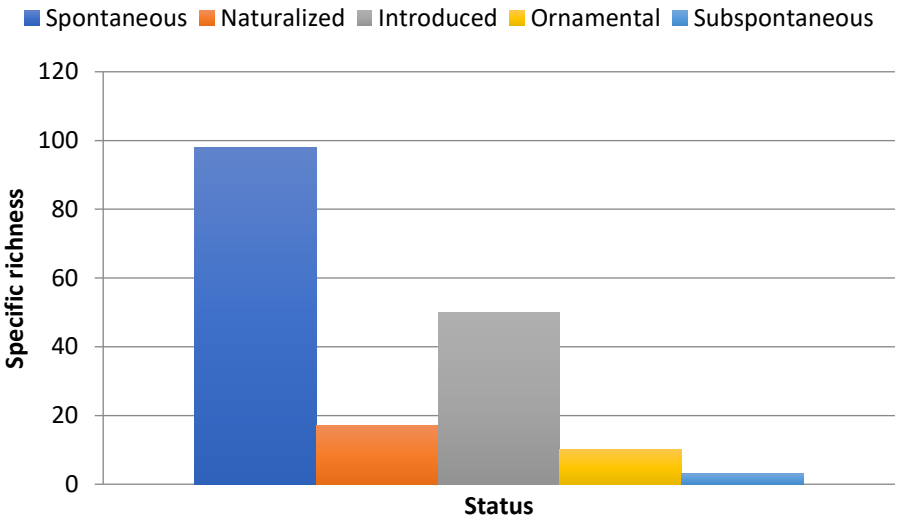

Figure 5. Representation of specific richness by status

Discussion

The prospecting carried out through the city of Kenitra allows it possible to identify 178 plant species belonging to 152 genera and 64 families. This specific richness represents nearly 3.3% of the vascular flora of Morocco that Fennane and Ibn Tatou (2012) evaluated at 3,913 species, 981 genera, and 155 families. It is remarkable biodiversity which can be explained by the geographical location of the city between the Mamora forest, the Atlantic coastline, and the cultivated plains of Gharb. We find, in fact, taxa that belong to the floral cortege of the cork oak such as Chamaerops humilis and Arisarum vulgar (Aafi, 2007), coastline species such as Euphorbia peplis, Sixalix atropurpurea var.maritima, and Medicago sp (Atbib, 1983) and species that are normally cultivated, for ornamental purposes or well vegetable gardens, but which the wind and animals have disseminated throughout the city; species such as Verbesina encelioides, Mirabilis jalapa, Arundo donax, and Lantana camara. This richness is also explained by the high number of species Introduced mainly for ornamental purposes which have become naturalized. Indeed, the city of Kenitra is surrounded by nurserymen and the progression of the seeds they handle is gaining ground towards the urban environment thanks to the dissemination by wind, man, or animals.

The richest family in species is the Asteraceae with 27 taxa; followed by Fabaceae with 13 species, then those of Poaceae (12 species) and Lamiaceae (8 species). The other families contain from 1 to 6 species (Figure 3). As regards the dominance of the Asteraceae family, these results are in agreement with the Moroccan vascular flora also dominated by this family (Fennane and Ibn Tattou, 2012). In the Mamora forest (Aafi, 2007), the Poaceae occupy the first place with 53 taxa; this family is represented in the city of Kénitra by 10 species including 7 Spontaneous: Anisantha sterilis, Cynodon dactylon, Hordeum murinum, Lagurus ovatus, Lamarckia aurea, Lolium multiflorum, and Poa annua.

From a biological type point of view, therophytes are the most represented (77 species), followed by Hemicryptophytes (29 species), Phanerophytes (24 species), Chamaephytes (19 species), Nanophanerophytes (16 species), Geophytes (10 species), and MesoPhanerophytes (3 species) (Figure 4). The biological spectrum of the vascular flora of Morocco shows the dominance of

therophytes, this dominance is a characteristic of the vegetation of the Mediterranean rim (Benabid, 2000). Therophytes, by their "r" type strategy, more easily manage to impose themselves in the most restrictive environments (Fertout-Mouri, 2018).

The cork oak or Quercus suber is the noble species that organizes the forest formation of the Mamora. It is there in places in a state of manifest wasting away. Rare specimens that stay in the urban environment must be preserved. This species should be present in all green spaces in the city of Kénitra and not only in the areas neighboring the Mamora cork grove. Individuals present in enclosures such as the Ibn Tofail university campus should be protected and public and private institutions should be sensitized to prioritize the cork oak as an ornamental tree and to consider it as an emblem of the city of Kenitra as it is. chamomile (Matricaria chamomilla) is only very rarely observed in urban areas. It must be said that this species is facing overexploitation in such a way that during all our surveys, we have not been able to observe it. Chamomile is used as a medicinal plant either orally (migraine attacks, painful periods, digestive disorders) or local use (eye irritation or discomfort, affections of the oral cavity and oropharynx). It colonizes abandoned land, gardens, paths, roadsides. This plant thrives in sandy clay environments.

The species that grow spontaneously are the most represented (98 species) followed by the species Introduced (50 species), Naturalizeds (17 species), Ornamentals (10 species), and finally the sub Spontaneous with 3 species (Figure 5). Most of the Spontaneous, subSpontaneous, and Naturalizeds species that have been identified in the urban environment studied are ruderal; they have nitrophilous affinities. Species that are frankly nitrophilous such as Nicotiana glauca, Solanum sodomaeum, and Ricinus communis occupy landfills and garbage dumps.

Among the most frequent Spontaneous species are Anacyclus radiatus, Malva sylvestris, Sonchus oleraceus, Lamarckia aurea,Verbascum sinuatum, Carduus pycnocephalus, Urticadioica. All these species are found in the Mamora forest especially in the edges where organic pollution is important. This same organic pollution promotes their pullulation in the urban environment. The loss of natural habitats has been caused by increasing urbanization which presents itself as a barrier to the dispersal of seeds. Indeed, the census carried out at the level Mamora forest (Aafi, 2007) which borders the city of Kenitra to the south and east shows the presence of 408 species, while the inventory carried out in the urban area reveals 128 taxa. The outskirts of the city on the south side, that is to say on the edge of the Mamora cork grove, still house a few cork oaks in the public garden and on the Ibn Tofail university campus. However, the cortege floristic procession of this species is no longer represented by more than a few feet of Chamaerops humilis. The provincial forest which borders the city on the southwest side is the reforestation of Eucalyptus whose undergrowth is almost absent

Herbaceous plants of Mamora, such as Arisarum vulgare, Anacyclus radiatus, arctotheca calendula, Bellis sylvestris, Calendula arvensis, Leontodon saxatile are observed with a relatively larger covery in the neighborhoods surrounding the cork grove. Going towards the city center where the buildings are dense, the presence of these species is less noted. In the west, species such as Euphorbia peplis, Sixalix atropurpurea var.maritima, and Medicago sp (Atbib, 1983) are observed making the connection with the flora of Sidi Boughaba.

The strong disturbances intrinsic to the urban environment, such as pollution, trampling, dry and superficial reworked soils, therefore impact the development of species and in fact, select them just as much as the physical barriers to their dispersion.

On the other hand, the city of Kenitra is an industrial city par excellence, especially on its northern side. The composition of urban vegetation and its phytosanitary status can provide information on the characteristics of the environment. Cupressus sp was used by Kebiche et al., (2001) as a bio-indicator of fluorinated pollution in the region of Setif in Algeria since it is a species very sensitive to fluorine. This catalog contains a gymnosperm, Cupressus sempervirens, which is widely used as an ornamental tree to border alleys. The observation of necrosis on the leaves of this species and the determination of the fluorine levels can reveal the degree of fluoride pollution, especially near industrial areas. Bouteraa (2014) was able to assess the variation in atmospheric pollution along the East-West motorway in the Canstantine region using Nerium oleander, which exhibits changes in morphological and physiological parameters in a polluted environment.

Conclusion

The plant biodiversity recorded in the city of Kenitra is 178 taxa. This relatively large wealth can be explained by the geographical location of the city bordered by the Mamora cork grove, the Atlantic coastline, and the Gharb plain. Herbaceous and Spontaneous plant species are dominant in the urban landscape. They grow along sidewalks, on cobblestones, and in abandoned urban areas. The influence of the Mamora cork grove is important towards the south of the city. The atmosphere of the Atlantic coastline impacts the flora to the west of the city. The city center, where the buildings are dense, escapes these two influences.

It is now known that urban biodiversity is not without consequences for city life. It provides various ecosystem services, the most important of which are: the regulation of rainwater infiltration, the oxygenation of the air, its depollution by the absorption of carbon dioxide, and the attenuation of the impact of heat islands generated by the expansion of concrete. Urban land-use planning strategies increasingly take the environmental side into account in their planning by developing green spaces where spontaneous flora, unfortunately, does not find its place; it is hunted down by gardeners and owners. Elsewhere, this vegetation is used for air and water quality monitoring.

It would be recommended to consider this flora in the management of the urban environment, choosing some of them, such as Quercus suber, Ceratonia siliqua, chamaerops humilis, or Retama monosperma, as ornamental plants and maintaining its establishment.

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