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FIRST CONTRIBUTION TO INVENTORY OF PLANTS WITH ALLERGENIC POLLEN IN THE MAADID REGION (M'SILA, ALGERIA)

Rebbas Khellaf*,, Hafsa Boubekeur***, Sabah Larit****, Saliha Benhissen*,*****#**

*Mohamed Boudiaf University of M'sila, PO Box 166 Ichebilia, 28 000, M'sila, Algeria
**Ibn Khaldoun Tiaret University, Laboratory of Agro-Biotechnology and Nutrition in Arid and Semi-arid zones, Algeria
***Mohamed Boudiaf University of M'sila, Faculty of Sciences, Department of Microbiology and Biochemistry, PO Box 166 Ichebilia, 28 000 M'sila, Algeria
****University of Skikda, Faculty of Sciences, Department of Agronomic Sciences, Laboratory for the Optimization of Agricultural Production in Sub-humid zones, 21000, Algeria
*****University of Badji Mokhtar, Faculty of Sciences, Department of Biology, Applied Neuroendocrinology Laboratory, Annaba, Algeria

Abstract

The allergenic pollen flora of the Maadid region includes 59 species belonging to 19 botanical families and 44 genera and is represented by 47 anemophilous species and 12 entomophilous species responsible for allergies. This flora was inventoried during March to April 2019. Three families, Poaceae, Anacardiaceae and Plantaginaceae dominate respectively. The chorological types of the species show the dominance of the elements of the Mediterranean group over all the other groups, followed by the cosmopolitan group. The biological types of species reveal the dominance of phanerophytes and therophytes over all biological types, hemicryptophytes and geophytes.

Key words: plants with allergenic pollen, inventory, biological type, chorology, Maadid, Algeria

INTRODUCTION

The Mediterranean climate is favorable to the development of evergreen vegetation, scerophyllous forests, Poaceae, Cupressaceae and Oleaceae.

Allergic rhinitis represents a major risk factor for asthma and relationships between pollen allergies and food allergies have been described. Finally, studies published in recent years show that climate change could influence pollen production, in particular by lengthening the pollen season, modifying spatial distribution and atmospheric pollution, and thus interfering with pollens and pollinosis (ANSES, 2014).

The frequency of pollen allergy could be induced by air pollution. Air pollution modifies the pollen composition, acts on the respiratory tract by weakening them and making them more sensitive to pollen and aggravates pollinosis (Charpin et al., 2016). The pollen production of anemophilous species is greater than entomophilous species because anemophilous pollination is hazardous. This production also depends on the genetic potential of the species and the age.

Corresponding author

In France, there is a National Aerobiological Surveillance Network (RNSA) whose purpose is to study biological particles in the air that can have an impact on the allergic risk for the population (pollens). It provides pollen monitoring at more than 60 sites across the country. This makes it possible to collect information on allergenic pollens, the pollen period and seasons, allergenic potentials and allergy prevalence rates (Alhamidi, 2017).

Note that there are several Aerobiological monitoring stations in Europe: Germany (Deutscher Wetterdienst & Stiftung deutscher Polleninformationdienst), England (Met Office health forecasts, National Pollen and Aerobiology Research Unit), Austria (Pollenwarndienst), REA (Red Espanola de Aerobiologia), AIA (Associazione Italiana di Aerobiologia), Luxembourg (Ministry of Health Aerobiology Station, Luxembourg-City Site), Portugal (RPA, 2024), South Tyrol (Polleninformationsdienst Südtirol).

In northern Morocco, an aeropalynological observation site was created in 2008 at the Faculty of Sciences of Tetouan and enabled the production of unpublished aerobiological data on a national scale. Several authors have contributed to the aerobiological study in Morocco (Aboulaich et al., 2009; Aboulaich et al., 2013; Achmakh et al., 2020; Bouziane et al., 2016; Boullayali et al., 2021; Saad et al., 2023).

In Algeria, there is no aerobiological monitoring network. Studies in this field are very limited, for example, Becila - Korteby et al., 1988 in Algiers, Ketfi, 1998 in El hadjar, Ketfi and Boughediri, 2006 in Annaba, Chafai - Ketfi et al., 2009 in Annaba, Ketfi, 2016 in Annaba, Alhamidi, 2017 in Tlemcen, Kazi Tani, 2017 on plants with allergenic pollen in Algeria, Chahat, 2018 in Guelma, Boughediri and Benslama, 2020, in Annaba and Necib et al., 2021 in Annaba.

The question that then arises is whether in Algeria allergen extracts produced in Europe can legitimately be used in allergen tests carried out by allergists and in clinical screening/desensitization practices. A science like phytogeography is well able to answer these questions, confirmed by clinical screening/desensitization practices (Kazi Tani, 2017).

For the floristic study of the Maadid area we used the nomenclature of the new flora of Quezel and Santa, 1962-1963, and the synonymous index of the Flora of North Africa by Dobignard and Chatelain, 2010-2013.

MATERIAL AND METHOD

Geographical location of the Maadid region

Maadid is located in the northwest of the wilaya of M'sila and is limited to the north by Bordj Bou Arreridj and to the east by Sétif and Batna, to the west by Hammam Dalaa and Ouled Mansour and to the south by Ouled Derradj (Fig. 1).

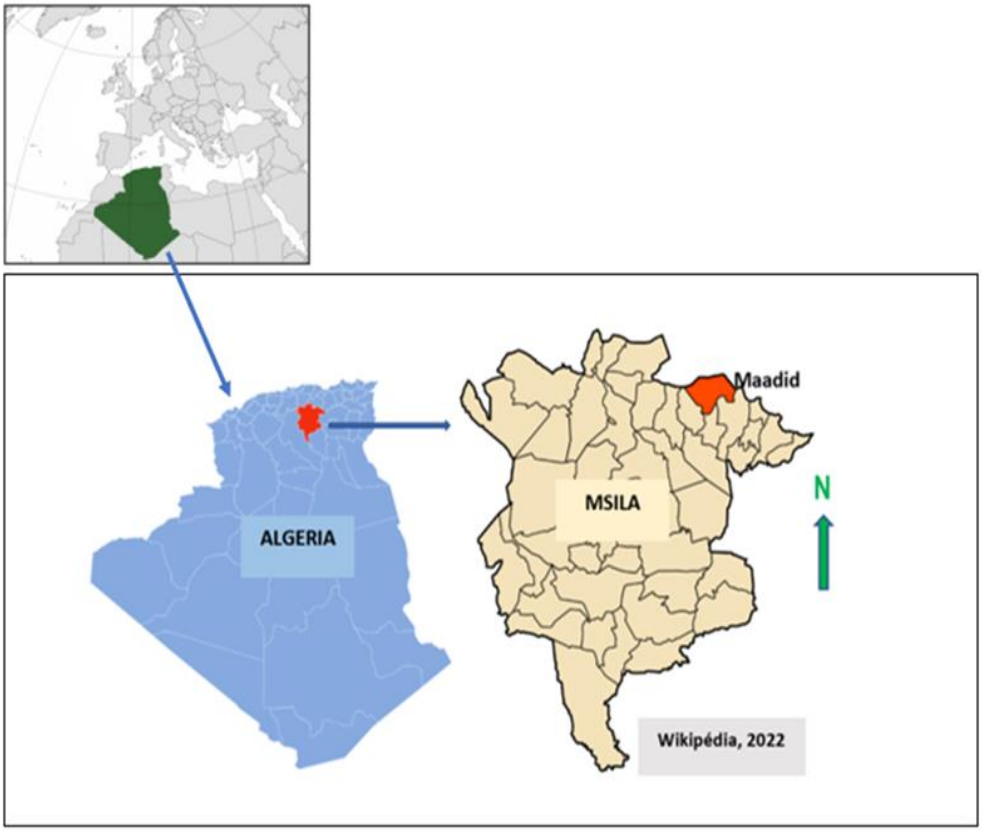

Fig. 1. Geographical location of Maadid

Note the absence of a meteorological station in the Maadid region. So we used the meteorological stations of M'sila and Bordj Bou Arreridj which are the closest.

The average annual precipitation is 221 mm, the average annual temperature is 19.38 °C, the coldest month is January, with 8.97 °C and the hottest month is July, 31.67 °C, at the M'sila meteorological station. On the other hand, we note 385 mm at the Bordj Bou Arreridj meteorological station with a maximum temperature of 36.7 °C in July, the minimum temperature drops to 2.5 °C, in January and the average annual temperature is 15.9 °C.

Rainfall drops significantly in the region of Chott el Hodna, the central part of which receives less than 200 mm. It decreases further on the southern piedmont of the Saharan Atlas (about 150 mm), decreasing rapidly as one moves away from the southern Atlas flexure towards the South. El Houerou et al., 1977, indicates that mountain ranges receive greater precipitation, from 400 to 500 mm in the Saharan Atlas and reaching more than 600 mm in the Hodna and Aures-Belezma mountains.

Field trip and sampling

We carried out several field trips to inventory the vegetation and phenological stages of each species. As indicated by Guinochet, 1973, sampling makes it possible to collect data by choosing elements so as to obtain objective information with measurable precision on the entire plant communication studied.

For this study we opted for subjective sampling which made it possible to carry out prospecting and floristic inventory of plants with allergic pollen in the Maadid region. A collection of plant samples was made between March and April 2019.

Determination and nomenclature of taxa

In alphabetical order of families, genera and species, our inventory results will be presented in the form of a table and each taxon is indicated its biological type. For the different chorological types, we used the method of Miara et al., 2017.

Likewise, the biological and chorological types follow the bibliographic documents consulted (Quézel and Santa, 1962-63; Dahmani, 1997; Rebbas, 2014) and our personal field observations.

RESULTS AND DISCUSSION

We present the flora with allergenic pollen in the Maadid region according to our floristic inventory and our field surveys and also based on the following works: Fornaciari et al., 2000; Chafai-Ketfi et al., 2009; Ketfi, 2016; Alhamidi, 2017; Kazi Tani, 2017 and Chahat, 2018.

Family and gender analysis

The list of allergenic pollen plants in Maadid amounts to 59 species (19 botanical families and 44 genera) (Table 1).

Note the Poaceae are the most represented with 24 species. Two families occupy second position with 4 species (Anacardiaceae and Plantaginaceae). Asteraceae, Cupressaceae, Oleaceae and Salicaceae occupy third position in the inventory (3 species). Other families are represented in the inventory by 2 species such as Moraceae, Myrtaceae, Pinaceae and Polygonaceae (Fig. 2).

Finally, the other families (Amaranthaceae, Araliaceae, Euphorbiaceae, Fabaceae, Fagaceae, Platanaceae and Tamaricaceae) are very poorly represented, with only one species each.

Table 1

List of plants with allergenic pollen in the Maadid region

Botanical families	**Latin species name**	**Sex./ Inflor.**	**Pollin fashion**	**organic type**	**Phytogeo origin**	**Period Flor.**
Amaranthaceae	*Atriplex halimus* L.	p	A	P	Med.-Saharo-Arabic	Apr.-Oct.
Anacardiaceae	*Pistacia atlantica* Desf.	d	E	P	Med-Irano-Tour	Feb.-Apr.
	Pistacia lentiscus L.	d	E	P	Med.	March-Apr.
	Pistacia terebinthus L.	d	E	P	Med.	Feb.-Apr.
	Schinus molle L.	h,g	E	P	South America	Apr-Aug
Araliaceae	*Hedera helix* L.	h	A	P	Temp.euras.	Sept.-Oct.
Asteraceae	*Bellis annua* L.	p	E	T	Med.	Feb-March
	Xanthium strumarium L.	p	E	T	North America	May-Sept
	Xanthium spinosum L.	p	E	T	North America	June-Sept.
Cupressaceae	*Cupressus sempervirens* L.*	m	A	P	Eur. Gold and West Asia.	Feb-Apr
	Juniperus oxycedrus L.	m	A	P	Med.	Feb-Apr
	Juniperus phoenicea L.	m	A	P	Med.	Feb-Apr
Euphorbiaceae	*Ricinus communis* L.	m	E	P	Sudano-Tropical	March-Nov
Fabaceae	*Spartium junceum* L.	h,g	E	P	Med.	Apr-June
Fagaceae	*Quercus ilex* L.	m	A	P	Med.	Feb-Apr
Moraceae	*Morus alba* L.*	m	A	P	China	Apr-May
	Morus nigra L.*	m	A	P	West Asia	Apr-May
Myrtaceae	*Eucalyptus camaldulensis* Dehnh.	h,mér.	E	P	Australia	June August
	Eucalyptus globulus Labill.	h,mér.	E	P	Australia	Feb-Jt
Oleaceae	*Fraxinus excelsior* L.	d	A	P	Eurasian	Feb-March
	Fraxinus angustifolia Vahl.	h,g	A	P	Eurasian	Feb-March
	Olea europaea L. var. *europaea**	h,g	E/A	P	Cultivated	Apr-June
Pinaceae	*Cedrus atlantica* Manetti	m	A	P	W.Med.	March-Apr.
	Pinus halepensis Mill.	m	A	P	Med.	Feb.-Apr.
Plantaginaceae	*Plantago psyllium* L.*	h,e	A	T	Submed.	Feb-May
	Plantago albicans L. *	h,e	A	H	Med.	March-May
	Plantago lagopus L.*	h,e	A	H	Med.	March-May
	Plantago major L.*	h,e	A	H	Eurasian	March-Oct.
Platanaceae	*Platanus orientalis* L. *	m	A	P	West Asia	Apr-May
Poaceae	*Phalaris canariensis* L.	h,e	A	T	Med.	Apr-Jt
	Phalaris minor Retz	h,e	A	T	Paleo-subtrop.	March-June
	Lagurus ovatus L.	h,e	A	T	Med.	March-May
	Cynodon dactylon (L.) Pers. *	h,e	A	hrm	Thermocosm.	May-Sept.
	Arundodonax L.	h,e	A	hrm	Med.	Jt-Dec.
	Phragmites communis Trin. *	h,e	A	hrm	Cosmo.	Oct.-Jan.
	Ampelodesma mauritanicum (Poir.) Dur. and Schinz.	h,e	A	H	W.Med.	March-June
	Avena sterilis L.*	h,e	A	T	Med.-Irano-Tour.	March-May
	Echinaria capitata (L.) Desf.	h,e	A	T	Atlantico-Med.	March-June
	Dactylis glomerata L. *	h,e	A	H	Paleotemp.	March-June
	Poa annua L.*	h,e	A	T	Cosmo.	Jan-June
	Bromus rubens L.*	h,e	A	T	Paleo-subtrop.	March-May
	Bromus madritensis L. *	h,e	A	T	Euro-Med.	Feb-June
	Brachypodium distachyum (L.) PB	h,e	A	T	Paleo-subtrop.	Apr-June

	Lolium rigidum Gaud. *	h,e	A	T	Paleo-subtrop.	March-June
	Lolium multiflorum Lamk. *	h,e	A	T	Med.	Apr-June
	Aegilops triuncialis L.	h,e	A	T	Med.-Irano-Tour.	Apr-June
	Hordeum murinum L.	h,e	A	T	Circumboreal	Apr-June
	Hordeum vulgare L.	h,e	A	T	Cultivated	Mar-Apr
	Triticum rigidum subsp. *Durum* (Desf.) Husn.	h,e	A	T	Cultivated	Mar-Apr
	Triticum aestivum L.	h,e	A	T	Cultivated	Mar-Apr
	Avena sativa L.	h,e	A	T	Cultivated	Mar-Apr
	Zea mays L.	h,e	A	T	Cultivated	June-Sept.
	Sorghum bicolor (L.) Moench	h,e	A	T	Cultivated	June-Sept.
Polygonaceae	*Rumex bucephalophorus* L.	h,g	A	T	Med.	Feb-May
	Rumex pulcher L.	h,g	A	H	Cosmopolitan	March-June
Salicaceae	*Salix pedicellata* Desf.	d	A	P	Med.	March-June
	Populus alba L.	d	A	P	Paleotemperate	March-Apr.
	Populus nigra L.	d	A	P	Paleotemperate	March-Apr.
Tamaricaceae	*Tamarix gallica* L.	h,g	E	P	Tropical North	March-Dec.

Sex.+Inflor. : Sex distribution, and type of inflorescence (m: monoecious; d: dioecious; h: hermaphrodite; p: polygamous; h,e: spike; h,p: panicle; h,g: raceme; h, c: in cyme; h, mer.: isolated flowers with androcea meristemone) - Pollin mode. : mode of pollination (A: anemophilous; E: entomophilous) – Bio type: biological types (P: phanerophyte for trees, shrubs and shrubs; H: hemicryptophyte for perennial and biennial herbs; Grh: geophyte with rhizome; T: therophyte for plants annuals) – Phytogeographical origin: phytogeographical origins of species – Period Flor. : flowering period in Algeria. The asterisk (*) indicates species with very high allergenic potential.

Analysis of biological types

Plant life forms are a valuable tool for describing the physiognomy and structure of vegetation. These elements are considered as an expression of the adaptation strategy of flora and vegetation to environmental conditions (Dahmani, 1997; Messaoudene et al., 2007).

The analysis of biological types in Table 1 clearly shows that phanerophytes and therophytes represent the most abundant biological types in the inventory, with 26 and 24 species respectively, followed by hemicryptophytes with 6 species and geophytes with 3 species.

Chorological types

The importance of the biogeographical diversity of Mediterranean Africa is explained by the climatic modifications undergone by this region since the Miocene, which have led to migrations of tropical and extratropical flora of which some vestiges are currently found (Quézel and Médail, 2003).

Quézel, 1999, emphasizes that a phytogeographical study constitutes an essential basis for any attempt to conserve biodiversity.

Table 1 shows that the Mediterranean group dominates compared to the other groups. There are 20 species of strictly Mediterranean elements followed by the wide distribution group which occupies second position with 10 species, bringing together cosmopolitans (4 species), 1 Euro-

Mediterranean species, west-Mediterranean with 2 species and 3 Iranian-Turanian species.

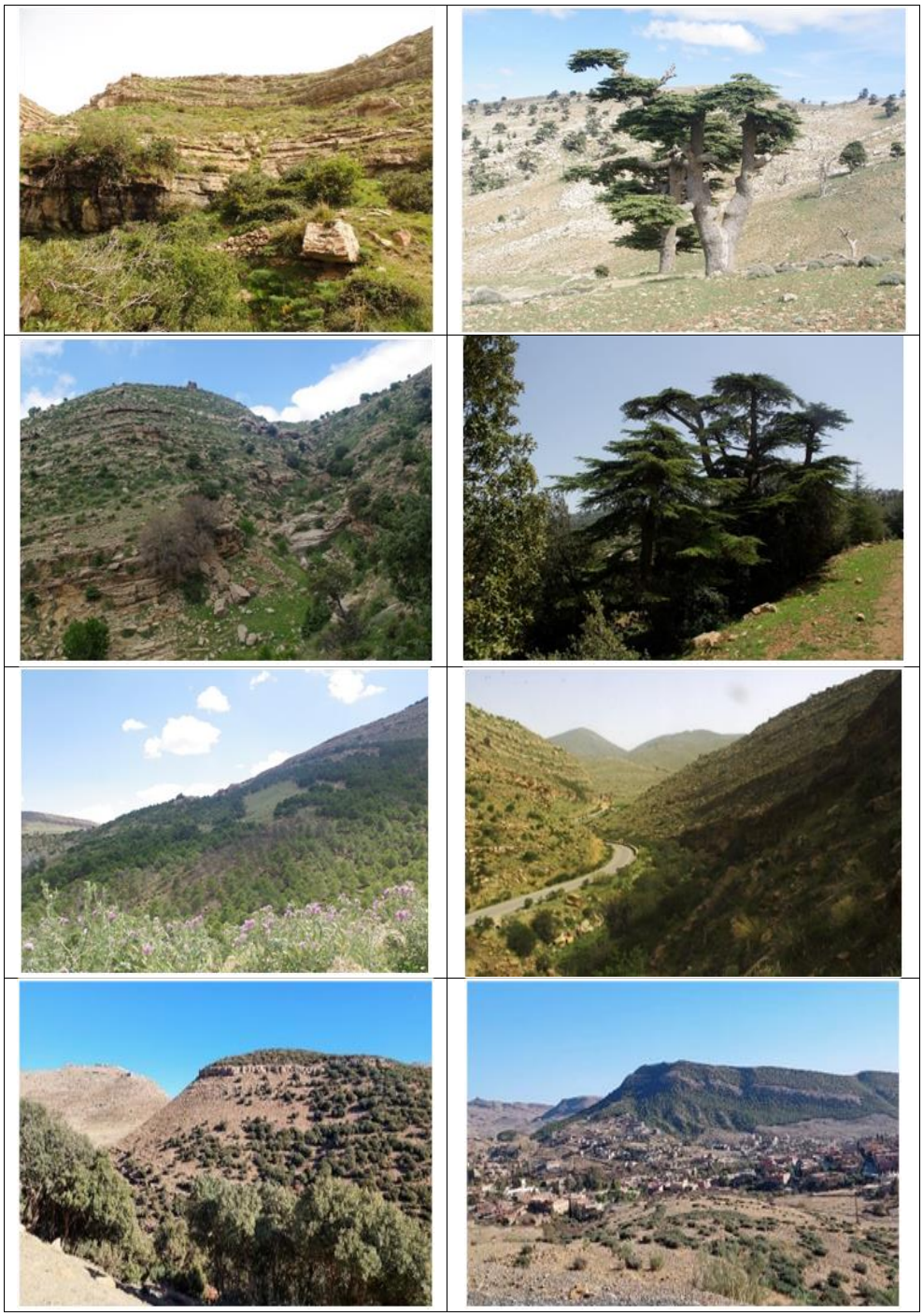

Fig. 2. General view of the vegetation of the Maadid region (Photos K. Rebbas)

On the other hand, the Nordic group is represented by Paleo-subtropical (5 species), Eurasian (4 species) and Paleo-temperate (3 species). Followed by the cultivated group (7 species), the North American group (3 species), the Australian group (2 species) and finally the other groups (Western Asia, China, Circumboreal, Med.-Saharo-Arab, Sudano- Tropical) are represented by a single species.

Mode of pollination and allergenicity

As Kazi Tani, 2017, indicates species with allergenic pollen in Algeria are divided between 75 % of anemophilous species responsible for the most severe allergies and 25 % of entomophilous species causing proximity allergies. The six botanical families responsible for the most acute pollinosis are Cupressaceae (3 major species), Poaceae (64 native and cultivated species, 27 of which present a very high allergenic risk), Moraceae (3 major species), Oleaceae (1 major species), Platanaceae (3 major species), Plantaginaceae (8 major species), and Urticaceae (3 major species). As a result, 48 pollen species are relevant to monitor from the point of view of health in Algeria, ie 28 % of all potentially allergenic species.

In the Maadid region, species with allergenic pollen are represented by 59 species between 47 anemophilous species and 12 entomophilous species responsible for allergies.

The families whose species have a very high allergenic potential are the *Poaceae* (*Cynodon dactylon* (L.) Pers., *Phragmites communis* Trin., *Avena sterilis* L., *Dactylis glomerata* L., *Poa annua* L., *Bromus rubens* L., *Bromus madritensis* L., *Lolium rigidum* Gaud., *Lolium multiflorum* Lamk.), *Plantaginaceae* (*Plantago psyllium* L., *Plantago albicans* L., *Plantago lagopus* L. and *Plantago major* L.), *Moraceae* (*Morus alba* L., *Morus nigra* L.), *Cupressaceae* (*Cupressus sempervirens* L.), *Oleaceae* (*Olea europaea* L. var. *europaea*) and *Platanaceae* (*Platanus orientalis* L.).

Many studies have shown that *Cupressaceae pollen* is the cause of winter pollinosis in the Mediterranean basin (Caramiello et al., 1991). The Cupressaceae are considered among the taxa responsible for allergic manifestations (Sell et al., 1993). In Italy, Ariano, 2008, reported that a single Cupressus sempervirens tree produces approximately 100 million pollen grains. Cupressaceae pollen is the most abundant pollen type in the Guelma region (Chahat, 2018).

Some authors have reported the Plantaginaceae among the taxa responsible for allergic manifestations (Iglisias-Otero et al., 2014). In southern Europe, several studies have shown that Plantago pollen increases the risk of allergies in patients with pollinosis (Garcia-Ortiz et al., 1995).

Poaceae pollen is considered an important source of allergens, substances responsible for approximately 50 % of cases of respiratory allergy

in France (Gorenflot, 1983). D'amato's, 1998, study on allergenic pollen showed that Poaceae pollen is the most important cause of pollinosis in the Mediterranean basin.

Olive (Olea europaea) pollen is considered one of the main causes of pollinosis in the Mediterranean region (Rojo et al., 2016). Florido et al., 1999, reported that pollen from Oleaceae, mainly olive, is the cause of seasonal allergic rhinitis and bronchial asthma in southern Spain. Certain species of Oleaceae such as Fraxinus excelsior and Ligustrum vulgare are cited by many authors as not very allergenic (Hemmer et al., 2000).

CONCLUSIONS

Allergenic pollen species inventoried in the Maadid region are represented by 47 anemophilous species and 12 entomophilous species responsible for allergies.

It is important to follow the main recommendations relating to the management of ornamental plants with allergenic pollens: diversify the planting of plants, in order to reduce the local concentrations of a particular pollen; limit the planting of these plants when they have an ornamental purpose (Inform local authorities of the risks associated with pollens); Labeling of the most allergenic species in green spaces; carry out campaigns to eradicate invasive species such as ragweed; monitor the introduction into the territory and the dispersal of species whose allergenic potential has already been revealed in other countries.

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