Fl. Medit. 22: 33-44
doi: 10.7320/FlMedit22.033
Version of Record published online on 28 December 2012

Ch. Kazi Tani, T. Le Bourgeois & F. Munoz

Alien *versus* native weeds present in crops of Oranie (North West Algeria): A comparative study of their life-history traits

Abstract

Kazi Tani, Ch., Le Bourgeois, T. & Munoz, F.: Alien *versus* native weeds present in crops of Oranie (North West Algeria): A comparative study of their life-history traits. — Fl. Medit. 22: 33-44. 2012. — ISSN: 1120-4052 printed, 2240-4538 online.

Algeria is the North African country with the largest number of alien weed species. The analysis of Oranie's weed flora showed 29 species of alien species which represents 1.62% from the 1,780 species of the whole spontaneous flora of the oranian phytogeographic territory and 6.82% of the local weed flora. Almost 40% of these species were native to the American continent and about 45% came from several tropical regions. The most representative life-history traits of these alien species compared to native ones were: annual cycle (79% *versus* 76%), summer germination (83% *versus* 15%), non-specialized dissemination strategies, but related with anthropic activities (72% *versus* 47%), self-pollination (75%), and the high proportion of C4 species (45% *versus* 4%). The agricultural biotopes mainly affected are summer-irrigated crops with short rotation and important nitrogenous fertilizers assignment. There are very few such habitats in Oranie, and few summer annuals in Algeria's flora. The success of alien weeds seems to result from suitability between environmental conditions of a newly created habitat (summer temperature, humidity, important nitrogen rate, frequent perturbations, short rotations, and ecological niches available) and species characteristics (annual type, summer germination, photosynthetic pathway in C4). Dispersal strategy and fecundation types seemed not to be of much importance to characterize these alien species.

Key words: Agrosystems, Field surveys, Phylogeny, Irrigated biotopes.

Introduction

Surprisingly, species introduction are not a real threat for Mediterranean ecosystems (Blondel & Aronson 1999). Today, only 1% of the Mediterranean Basin's flora can be considered as exotic species and very few have known dramatic expansion. The low invasiveness of Mediterranean ecosystems contrasts sharply with the situation in other regions of the world characterized with Mediterranean-type climate: 20% for California, 54% for South West Australia, and 57% for South Africa (Blondel & Aronson 1999; Quézel 2002). We should not forget that California was settled by people from the Mediterranean itself and that most early introductions came from the Iberian Peninsula. While the success of introduced species from the Mediterranean to other Mediterranean-type regions of the New World is due to their pre-adaptation to a set of environmental factors (fire, overgrazing, soil disturbance, climatic pressures) the reasons for why the Mediterranean Basin is relatively resistant to species introduction are not well known (continuous human activities and disturbances for over many millennia, all available ecological niches optimally used) (Di Castri & al. 1990; Breton 1997; Blondel & Aronson 1999). Native weeds had enough time to evolve and to occupy cultivated habitats with very high performance.

According to Meggaro & al. (1998), from all northern African countries, Algeria is the one with the largest number of alien species per unit of area (Meggaro & al. 1998). However, more recent data from Dobignard & Chatelain (2011) make it in the second rank after Morroco although the first country shelters more aliens (234 species) than the second one (228 species) (Table 1).

In Algeria, besides the alien species intentionally or unintentionally introduced by prehistoric man as well as antique civilizations, mainly Phoenician or Roman, other more important introductions have taken place during French colonization (1830-1962). However and contrarily to what have been seen in Europe (e.g. France: Maillet 1992), invasion waves didn't spread over time in a quite homogenous way since the discovery of the American continent in the XVIth century, but they rather hurled during the first half of the past century. Although the Hamma (Algiers) botanical garden have been created since 1844 in order to acclimate exotic plants, the bulk of introductions has taken place during the 1930-1960 period which has been characterized by the development of irrigation (great hydraulic managements), the spread of market gardening (potatoes, tomatoes, maize, beetroot, rice, etc.) and orchards (citrus fruits, vines), and farm mechanisation thrust (Khiati 2008).

The term alien (introduced, exotic, non-native…) is generally associated to any species introduced outside their biogeographical territory into their non-native habitat (Booth & al. 2003). In the present study, following Lambdon & al. (2008) in their analysis of the European alien flora, we consider as alien only the species that have been introduced subsequently to 1500 CE. A certain number of common life-history traits characterize those species: short life cycle, high and efficient sexual reproduction, high dispersal ability, autogamy, polyploidy, phenotypic plasticity due to genetic diversity (Roy 1990).

Only a deep knowledge of both life-history traits and intrinsic species attributes (biological, ecological and genetic), in interaction with the characteristics of the colonized environment should explain the survival success of alien species in their new environment.

Table 1. North African countries rank according to alien species per unit of area.

Country	**Area (km^2)**	**Total number of alien species**	**Alien species/ log area**
Morroco	458,730	228	17.47
Algeria	2,300,980	234	15.97
Egypt	997,739	168	12.15
Tunisia	154,530	121	10.11
Lybia	1,760,000	116	8.06

Numerous studies have been focussed on the determination of suites of traits that make alien species successful invasive (e.g. for Australia: Newsome & Noble 1986). Even if a certain number of general attributes allow defining invaders, some exceptions however remain unexplained (Roy 1990). Not any species embraces all the typical characteristics of a good invasive, and not all of these later are necessary for a given species to become invasive (Roy 1990). Intend to identify a group of traits associated with invading ability unique to all plant species seem impossible (Williamson 1999). However, the comparative approach of life-history traits between alien weeds and native weeds remains necessary to identify key-factors allowing understanding colonization process and thus helping a better management of these invasive species (Baker 1965; Cadotte & al. 2006; Celesti-Grapow & al. 2010; Maillet & Lopez-Garcia 2000; Roy 1990).

Oranie (North West Algeria) shelters about 1,780 flowering plants species, i.e. 57% of the total flora of the country (Quézel & Santa 1962-1963). In this Mediterranean region, we have characterized, in a previous paper based on 547 vegetation surveys in rain fed (winter cereals, vines, stone trees, etc.) and irrigated fields (summer market gardening, citrus orchards, etc.), the 425 weed species according to agrosystems and environmental conditions (Kazi Tani & al. 2010). The actual work presents the results of comparative analysis between some selected life-history traits of alien weeds and those presented by native weeds in order to better understand their development, and the agroenvironmental conditions which assist them so as to forestall the development of new species noxious to crops.

Materials and methods

A database was created comprising all listed weed species with their respective Latin names according to *"Nouvelle Flore de l'Algérie"* of Quézel & Santa (1962-1963) and the seven following biological attributes (appendix 1): (1) geographical origin, (2) biological type, (3) germinating period, (4) dispersal type, (5) reproduction type, (6) photosynthetic type, and (7) abundance as indicated in *"Nouvelle Flore de l'Algérie"*. However, a certain number of cells remained empty for lack of information, especially concerning reproduction type of native weed species. Next, we have realised a comparison between alien and native weeds based on the selected biological attributes in order to see whether there were any differences in the frequencies of theses attributes between the two categories of weeds.

Concerning dispersal methods, we distinguished anemochory and zoochory which are respectively long (> 100 m) or middle (> 5 m) distance dispersal, and clitochory which is short distance dispersal (< 5 m) (Van Der Pijl 1982). The majority of weeds, even those that show no special anatomical adaptations in their diaspores, are easily dispersed by water (short distance dispersal), and structural modifications of nautohydrochory (ability for floating and transporting on the surface of water) are often based on anemochory (Radosevich & Holt 1984; Van Der Pijl 1982).

The differences between the selected biological attributes of alien and native weeds have been statistically evaluated through chi-square test (χ^2) implemented under *R* (R Development Core Team 2010).

Results

Distribution of the alien weed flora according to crop types

Twenty-nine species of alien weeds have been registered in the crops of Oranie (Appendix 1) representing 6.82 % of the 425 weed species thriving in the fields of the area (Kazi Tani & al. 2010), and 1.62 % of the 1,780 spontaneous plant species of the Oranian phytogeographic territory. Alien weed flora distribution according to the studied crop types is listed in table 2. χ^2 test cannot directly be worked out because there is only one alien species in fallows and two in winter cereals.

Alien weeds settle mostly in summer irrigated market gardening and in a lesser degree in the summer facies of *Citrus* orchards. The crops that are less rich in alien weeds belong to the cereal-fallow land utilization system. Among perennial ligneous crops, orchards show more alien species than vineyards particularly during summer.

Comparative phylogeny of the alien and native weed flora

The totality of the reported alien weed species is Angiosperms distributed in 10 botanical families and 17 genera of which (Table 3):

- 2 families, 5 genera and 7 species of Monocots;
- 8 families, 13 genera and 22 species of Eudicots.

The native weed flora, as for it, is distributed in 51 Angiosperms families and 217 genera of which (Kazi Tani & al. 2010):

- 6 families, 38 genera and 57 species of Monocots;
- 45 families, 179 genera and 354 species of Eudicots.

The number of Monocots species over the number of Eudicots species, M/E ratio, concerning native weeds is 16%. This ratio is double, about 32%, concerning alien weeds, showing the importance of the participation of Monocots species to the alien weed flora.

The three largest alien weed families are: *Asteraceae* (27.58%), *Poaceae* (20.68%) and *Amaranthaceae* (20.68%). The other botanical families totalize only 8 genera and 9 species (31.03%). In a previous work concerning the Oranian native weed flora, we have shown that it is dominated with *Asteraceae* (15.76%), *Fabaceae* (12.70%) and *Poaceae* (10.58%) (Kazi Tani & al. 2010).

Table 2. Distribution of Oranie's alien weeds according to crop types.

	Crop types					
	Summer irrigated market gardening	Rain fed vegetables	Orchards	Vineyards	Winter cereals	Fallows
Total number of weed	77	174	182	191	274	271
% aliens compared with total number of weed	21	3.5	4	3	0.72	0.36
% natives compared with total weed	79	96.50	96	97.50	99	99.50
% aliens by crop compared with total alien weed	55	21	24	17	7	3.50

Table 3. Oranie's alien and native weed comparative phylogeny.

Angiosperms	Phylogeny	Alien weed flora	Native weed flora
Monocots	Families	2	6
	Genera	5	38
	Species	7	57
Eudicots	Families	8	45
	Genera	13	179
	Species	22	354
Monocots species number/Eudicots species number ratio (%)		32	16

Comparative analysis of selected life traits of the alien weed flora versus native one

As shown on table 4, weeds' biological spectrum as they are alien or native, is always dominated with annuals (79.50% *versus* 75.50%). On the other hand, the participation of geophytes in the spectrum is clearly more important in alien weeds (20.50%) than in native weeds (7.50%); $\chi 2$ is equal to 10.58 for $v = 2$, $p = 0.006$.

Clitochory is the main dispersal strategy for alien weeds, 72.50% *versus* 46.50% for native weeds; $\chi 2$ value is 9.59 for $v = 3$, $p = 0.02$. Anemochory is presented by 17% of the alien species *versus* 19.50% for natives.

Zoochory is observed in 10.50% of alien species, mainly *Xanthium* spp with a hardened fruiting involucre covered with glochidiated prickles, while this dispersal strategy concerns 16% of native weeds.

If a large number of alien weeds (55%) are C_3 plants *versus* 96.50% for native species, C_4 plants are also quite important (45%), particularly among *Amaranthaceae* and *Poaceae* while they are represented in native weeds with only 3.50%; $\chi 2$ value is 73 for $v = 1$, $p < 0.001$.

About 72.50% of alien weeds are quite common to very common *versus* 90% for native weeds, while 27.50% of alien weeds remain quite rare to very rare *versus* 10.50% for native weeds; $\chi 2$ value is 6 for $v = 1$, $p = 0.014$.

Summer-irrigated crops constitute the most favourable biotope for the development of alien weeds notably C_4 and succeed in sheltering at least 16% of the total species number.

However, for both weeds groups, the dispersal method restricted in space from the mother-plant or clitochory, remains the most widespread.

Reproduction systems and biological types

Most of the alien weeds (75%) show complete autogamy or combine it with allogamy, but are very rarely completely allogamous (8.50%). Sometimes the reproduction system is exclusively vegetative (16.50%) as it is the case for *Oxalis* spp. Concerning native weeds

Table 4. Comparative table of selected life-history traits of native versus alien weeds with χ2 test for each type of attribute (significance at 5% pointed out with an asterisk).

Weeds' attributes		**Native species (total = 425)**		**Alien species (total = 29)**		**Statistical test by attribute**
		Number	%	Number	%	
Biological form	Therophytes	321	75.50	23	79.50	$\chi 2$=10.58, *v=2*, *p*=0.006*
	Geophytes	32	7.50	6	20.50	
	Other	72	17	0	0	
Germination	Spring and/or summer germination	63	14.82	24	83	$\chi 2$=81.59, *v* =*2*, *p*<0.001*
	Autumn and/or winter germination	271	64	2	7	
	Other	91	21.50	3	10.50	
Dispersal	Anemochory	82	19.50	5	17	$\chi 2$=9.59, *v=3*, *p*=0.02*
	Zoochory	69	16	3	10.50	
	Clitochory	198	46.50	21	72.50	
	Other	76	18	0	0	
Photosynthesis	C_4	15	3.50	13	45	$\chi 2$=73, *v* =1, *p*<0.001*
	C_3	410	96.50	16	55	
Abundance in oranian territory	Common to very common	380	90	21	72.50	$\chi 2$=6, *v* =1, *p*=0.014*
	Rare to very rare	45	10.50	8	27.50	

we don't have data on reproduction types. In France, Maillet (1992) states, that in vineyards almost 82% of the weeds is self-compatible.

If we examine the repartition of biological types for alien weeds according to reproduction systems (Table 5), therophytes seem to be preferentially autogamous or autogamous/allogamous, and the geophytes have almost exclusively a vegetative reproduction. However, compared with the small number of inventoried alien weeds, it is not possible to draw conclusions statistically reliable.

Discussion

The 29 alien weed species analysed in this study represent 1.62 % of the 1,780 plant species harboured by the Oranian phytogeographic territory (appendix 1). This number has

Table 5. Reproduction systems and biological types contingency table for alien weeds.

	Reproduction systems				
Biological types	Autrogamous	Allogamous	Auto/Allo	Vegetative	Total
Therophytes	9	2	8	0	19
Geophytes	0	0	1	4	5
Total	9	2	9	4	24

is to be put side by side with the 2% anthropophytes forwarded by Le Floc'h & al. (1990) for North Africa. The biotopes that support the highest proportions of alien weeds are those characterized by their high humidity and nitrogen levels during summer, and their short crop rotation. This phenomenon has already been reported in other Mediterranean countries (for France: Maillet 1997; for Israël: Dafni & Heller 1982). Such crops requiring high temperatures and permanent irrigations, themselves of foreign origin, have created habitats which don't necessarily exist before because they are historically recent for the area. The contrasting absence of alien weeds in fall and spring cultivations is due to the fact that those agrosystems are very old in the region and that native weeds, the so called archeophytes, occupy the cultivated biotopes in a competitive manner since very long time ago (Maillet 1997). The oldest ethnobotanical evidences for the Algerian Tell concern segetal plants found in the Caspian site of Capéletti's cave (Aurès) by Roubet (1979) and are dating back to 4 580 BCE. In return, the aestival type is less frequent among Mediterranean weed species, where the seeds are often dormant during the hot, dry season. But, many tropical or subtropical species are not dormant during that period. The need for a climatic similitude between region of origin and that of reception is then evaded. The fact that very few spontaneous species are able to present an aestival cycle explains the success of many exotic species in Algeria. The same remark has been done for the case of France (Jauzein 2001) and probably in the whole Mediterranean area.

The fact that *Asteraceae, Poaceae* and *Amaranthaceae* are the largest alien weed families (about 60%) has been reported in other Mediterranean countries such as Catalonia (Spain) by Recasens & Conesa (1998). Daehler (1998) remarked that *Poaceae* were over-represented among weeds and invasive species and that they have the tendency of forming monospecific stands. However, at the level of North Africa, the great importance of *Asteraceae* in the alien weed flora have been pointed out only in Algeria, whereas for the most other countries, *Amaranthaceae* and *Brassicaceae* dominate alien weeds (Meggaro & al. 1998). Generally, *Asteraceae* and *Poaceae* remain the largest weed families, native as well as alien, of cultivated lands in Oranie. However, at lower taxonomical ranks, things change. For the *Asteraceae*, taxons which belong to *Lactucoideae* Solbrig (*Liguliflorae*) subfamily, with the tribe of *Lactuceae* Cass. are prevailing among natives, while taxons which belong to *Carduoideae* Kitam. (*Tubulifloreae*) subfamily, with the tribes of *Astereae* Cass. and *Heliantheae* Cass., are prevailing among aliens. For the *Poaceae*, taxons which belong to *Festucoideae* R. Br. subfamily prevail among natives, while taxons which belong to *Panicoideae* R. Br. subfamily prevail among aliens.

The low number of Afro-Tropical alien species (about 30%) is due to the massive Afro-Arabian deserts, dating back to the Miocene-Pliocene boundary (5-6 Myr BCE), and the east-west orientation of the Mediterranean Sea as well as mountain chains which have seriously impeded south-north biological exchanges and prevented them from colonizing the Mediterranean territory with the same success as many Euro-Siberian and Irano-Turanian species achieved (Blondel & Aronson 1999). The great majority of alien species (more than 40%) comes from the American continent (appendix 1), which is also often the place of origin of imported crop seeds, while the weakest participation is recorded for species from South Africa. Weeds of Tropical origin are quite numerous (at least 45%), which corroborate observations made in other Mediterranean countries (e.g. Recasens & Conesa 1998; Maillet 1997).

Alien weeds are in greater part therophytes (79.50%). A close percentage (70%) has been found in crops of Catalonia (Recasens & Conesa 1998). In a certain extent, therophytes and geophytes are both biologically efficacious in transmitting wholly or partly of an individual's genotype although the involved organs are different.

Concerning the life cycle, species with summer or prolonged spring germination are predominant (83%) among alien weeds. A close percentage (90%) has been found among exotic weeds present in crops of Catalonia (Recasens & Conesa 1998). Native weeds show, contrarily, autumn or winter germination. This is otherwise in complete conformity with the germination ecology of the Mediterranean flora for which the germination period for the great majority of species is a stickler for the two most humid seasons of the year, autumn and winter, the dead season being summer.

The proportion of C_4 species is particularly important in summer's cultivations where they represent very important hazards because they are among the most abundant, the most noxious and the most invasive. C_3 species seem to be not possible to establish in the crops unless they have an aestival cycle (*Xanthium* spp., *Datura* spp., *Abutilon* spp.), an important seed production suited with long-distance dispersal, and adapted to a broad range of habitats (Maillet 1997).

The main dispersal strategy of alien weeds is clitochory (72.50%), which proves that their spread requires human intervention and that establishment prevails over dispersal, avoiding a useless waste of energy. A quite close number has been found by Recasens & Conesa (1998) for the exotic weeds of Catalonia (65%).

Therophytes seem to be completely or preferentially autogamous. The same observation has been done by Maillet (1992) in France. Exclusive autogamy or combined with allogamy seem to promote synanthropization, i.e. the establishment of a given species in man-modified or man-made biotopes (Cronk & Fuller 1995; Maillet 1997). Mixed reproduction system (autogamy/allogamy) allows, effectively, the foundation of new populations with a reduced number of individuals (Stebbins 1971). However, the hypothetical advantage of an autogamous reproduction as an important weediness character (Baker 1974) has not been verified in the case of Oranie's alien weeds. More than one reproduction type or another, it's the flexibility of the reproduction system that is the cause of alien species success.

Finally, two remarks: the success met with different species of the genus *Amaranthus* in Oranie (six species already present in the crops of the region), the richness of this genus (fifty species around the world) and its very high seed output (more than 40,000 seeds/individual) having great longevity let predict other invasions of the agrosystems. Two other species are potentially candidate to invade Oranie's cultivated lands, the populations of which need to be watched over with caution: *Chenopodium ambrosioides* L. (*Chenopodiaceae*) and *Artemisia verlotiorum* Lamotte (*Asteraceae*) present in the region on more or less artificialized habitats (littoral marshes, rubbish, waterstream banks) and stated invasive in other West-Mediterranean countries.

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Addresses of the authors:
Choukry Kazi Tani[1], Thomas Le Bourgeois[2]& François Munoz[3]
[1] Département des Sciences Agronomiques et des Forêts, Faculté des Sciences de la Nature et de la Vie, des Sciences de la Terre et de l'Univers, Université Abou Bekr Belkaïd, B.P. 119, 13 000 Tlemcen, Algérie – E.mail: kazi_tc@yahoo.com
[2] CIRAD, UMR AMAP, TA A51/PS2, 34398 Montpellier cedex 5, France.
[3] UM2, UMR AMAP, TA A51/PS2, 34398 Montpellier cedex 5, France.

While the present paper is being published, KAZI TANI Choukry discovered two new alien species in crops of Oranie: *Galinsoga parviflora* Cav. (*Asteraceae*) and *Cuscuta campestris* Yuncker (*Convolvulaceae*).

Appendix 1. Biological attributes of alien weed species present in crops of Oranie.

Taxon	**Family**	**Abund.**	**Origin**	**Biol. type**	**Germ.**	**Disper.**	**Reprod.**	**C_3/C_4**
Abutilon theophrasti Medic.	*Malvaceae*	R	Euras.	Th.	Sp,S	Clito.	Auto	C_3
Amaranthus albus L.	*Amaranthaceae*	QC	N. Amer.	Th.	Sp,S	Clito.	Auto/Allo	C_4
Amaranthus angustifolius subsp. *sylvestris* (Desf.) Maire & Weiller	*Amaranthaceae*	C	Euras.-Af.	Th.	Sp,S	Clito.	Auto/Allo	C_4
Amaranthus deflexus L.	*Amaranthaceae*	C	Amer.	G./Th.	S	Clito.	Auto/Allo	C_4
Amaranthus lividus L.	*Amaranthaceae*	QC	Pantrop.	Th.	S	Clito.	-	C_4
Amaranthus retroflexus L.	*Amaranthaceae*	AC	N. Amer.	Th.	Sp,S	Clito.	Auto/Allo	C_4
Amaranthus hybridus subsp. *Hypochondriacus* (L.) Thell.	*Amaranthaceae*	C	Amer.	Th.	Sp,S	Clito.	Auto/Allo	C_4
Aster squamatus Hier.	*Asteraceae*	C	S. Amer.	Th.	P	Anemo.	Allo	C_3
Chenopodium ambrosioides L.	*Chenopodiaceae*	C	Amer.	Th.	Sp,S	Clitoc.	Allo	C_3
Conyza naudini Bonnet	*Asteraceae*	C	Amer.	Th.	A,W, Sp,S	Anemo.	Auto/Allo	C_3
Cuscuta suaveolens Seringe	*Convolvulaceae*	VR	S. Amer.	Th.	S	Clito	-	C_3
Cyperus rotundus L.	*Cyperaceae*	C	Paleo-Trop.	G.	S	Clito.	Vegetative	C_4
Datura stramonium L.	*Solanaceae*	QC	S. Trop.	Th.	S	Clito.	Auto	C_3
Digitaria sanguinalis (L.) Scop.	*Poaceae*	VC	Thermo-cosm.	Th.	S	Clito.	Auto	C_4
Echinochloa colona (L.) Link.	*Poaceae*	C	Pantrop.	Th.	S	Clito.	-	C_4
Erigeron canadensis L.	*Asteraceae*	C	Amer.	Th.	Sp,S,A	Anemo.	Auto/Allo	C_3
Erigeron bonariensis L.	*Asteraceae*	C	Amer.	Th.	Sp,S,A	Anemo.	Auto/Allo	C_3
Gundelia tournefortii L.	*Asteraceae*	R	Iran.-Tur.	G.	A,W	Anemo.	-	C_3
Hibiscus trionum L.	*Malvaceae*	R	Trop.	Th.	S	Clito.	-	C_3
Oxalis cernua Thumb.	*Oxalidaceae*	VC	Af.S.	G.	Sp,S	Clito.	Vegetative	C_3
Oxalis compressa Jacqu.	*Oxalidaceae*	QR	Af.S.	G.	Sp,S	Clito.	Vegetative	C_3
Paspalum distichum L.	*Poaceae*	R	Pantrop.	G.	Sp,S	Clito.	Vegetative	C_4
Setaria lutescens (Weigg.) Hubb.	*Poaceae*	QR	Thermo-cosm.	Th.	S	Clito.	Auto	C_4
Setaria verticillata (L.) P.B.	*Poaceae*	C	Thermo-cosm.	Th.	S	Clito.	Auto	C_4
Setaria viridis (L.) P.B.	*Poaceae*	C	Temp.-Subtrop.	Th.	S	Clito.	Auto	C_4
Veronica persica All.	*Scrophulariaceae*	VR	W. As.*	Th.	A,W	Clito.	Auto/Allo	C_3
Xanthium italicum Moretti	*Asteraceae*	C	Amer.	Th.	S	Zoo.	Auto	C_3
Xanthium spinosum L.	*Asteraceae*	C	S.Trop.	Th.	Sp,S	Zoo.	Auto	C_3
Xanthium strumarium L.	*Asteraceae*	VC	S.Trop.	Th.	S	Zoo.	Auto	C_3

Abundance: in Oranian territory according to Quézel & Santa (1962-1963); QC, quite common; C, common; VC, very common; QR, quite rare; R, rare; VR, very rare - Origin: Af., Africa; Amer., America; As., Asia; Euras. Eurasia; Iran.-Tur., Irano-Turanian; Temp.-Subtrop., Temperate-Subtropical; Thermo-cosm., Thermocosmopolite; Trop., Tropical - biological type: Th., Therophyte; G. Geophyte; P., Parasite – Period of germination: A, autumn; W, winter; Sp, spring; S, summer – Dispersal type: Anemo, anemochory; Clito, clitochory; Zoo, zoochory – Reproduction type: Auto, autogamous; allo, allogamous; vegetative – Photosynthetic type: C_3 ou C_4. (*) Irano-Turanian, extending into Mediterranean region and Europe.