SUNFLOWER WEED FLORA IN PORTUGAL

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Abstract: Thirty sunflower fields were surveyed from May to June 1994 in Lezíria Grande de Vila Franca de Xira and Alvalade. In total, 116 weed species belonging to 30 families were recorded. The ecological profiles of the corrected frequences were calculated for the 50 species with higher mutual information for the following factors: "geographical situation", "texture", "pH($H_2$0)" "pH(KCl)", "assimilable phosphorus", "assimilable potassium", "organic matter", "soil drainage", "cultural antecedent", "weed control", "crop area", "irrigation", "level of weed infestation", and "number of species per field". Species were grouped in ecological groups and their ecological preferences were determined.
The species presenting a frequency higher than 50% and an average abundance higher than 2 plants/m^2 were *Amaranthus retroflexus, Chenopodium album, Convolvulus arvensis, Datura stramonium, Foeniculum vulgare, Lavatera cretica, Picris echioides, Polygonum aviculare, Rumex crispus, Sinapis arvensis* and *Sonchus oleraceus.*

INTRODUCTION

Sunflower weed control was usually made by herbicide applications, however, nowadays, due to the agriculture politic of inputs reduction and the support atributed to the sunflower crop, fertilizers and herbicides are commonlly not used and the crop area was enlarged. Consequently, a change in weed flora is expected.

The main objectives of this work were: the caracterization of sunflower weed flora in two important agricultural regions, Lezíria Grande of Vila Franca de Xira with neutral and basic soils and Alvalade with acid soils; the relation species-factors to know the ecological species behaviour; the importance of the ecological factors on flora composition and its diversity.

MATERIAL AND METHODS

From May to June 1994 sunflower fields were surveyed and phytotechnical inquires were carried on (Figueira, 1994). Soil samples at 20 cm deep were also collected for further analysis of some physical-chemical characteristics. An abundance index was atributed to the inventariated species, corresponding to the plant number by square meter, using the Barralis abundance scale (1976), this allows to calculate the media abundance of each species. The infestation degree was determinated as Michez & Guillerm (1984). The information shared between species and the ecological factors was analysed using the ecological profiles method

(Daget & Godron, 1982). Species were grouped in ecological groups as refered by Guillerm (1969), Daget *et al.* (1971) and Daget (1976).

RESULTS AND DISCUSSION

A total of 116 *taxa* were identified. The annual species are predominant (77%) followed by the perennial (18%), distributed by 30 families, with predominance of *Compositae* (18.1%), *Gramineae* (18.1%), *Leguminosae* (8.6%), *Cruciferae* (6%), *Polygonaceae* (6%) and *Chenopodiaceae* (5.2%).

The following species *Amaranthus retroflexus, Chenopodium album, Convolvulus arvensis, Datura stramonium, Foeniculum vulgare, Lavatera cretica, Picris echioides, Polygonum aviculare, Rumex crispus, Sinapis arvensis* and *Sonchus oleraceus* presented a high infestation degree (fig. 1). *C. arvensis*, *P. aviculare* and *P. echioides* were also the most frequent and abundant species in Southern Spain (Córdoba) (Saavedra *et al.*, 1989; Hidalgo *et al.*, 1990). The species *Cardaria draba* and *Polygonum persicaria* were identified only in one field but with more than 35 plants/m^2.

The relation between mean mutual information for 50 species with the highest information content and equitability of sampling is presented in fig. 2.

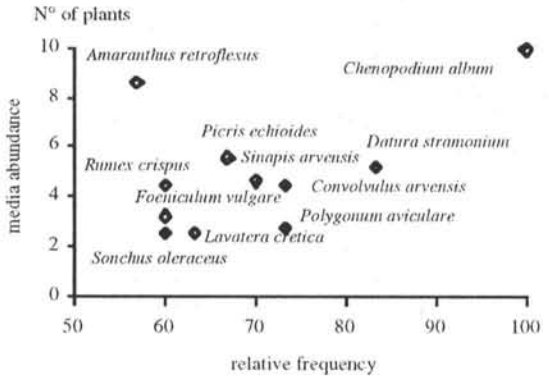

Figure 1 - Infestation degree of some species identified in 30 sunflower fields in Lezíria Grande and Alvalade.

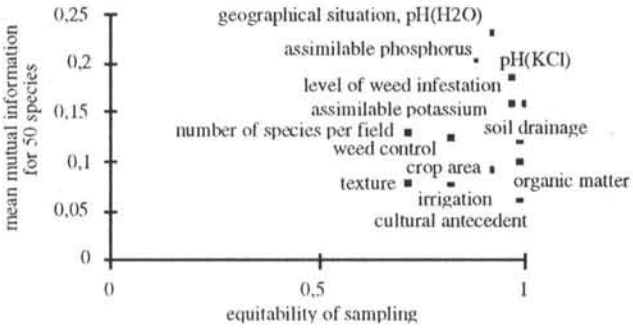

Figure 2 - Relationships between mean mutual information for the species with equitability of sampling.

Comprehensive profiles for the factors are given in [ ]:

. region 1 = Lezíria Grande [20], 2 = Alvalade[10];
. pH (H2O)1 = acid[10], 2 = neutral or basic [20];
. assimilable phosphorus 1 = (<200ppm) [9], 2 = (>200ppm) [21];
. assimilable potassium 1 = (<200ppm) [12], 2 = (>200ppm) [18];
. weed control 1 = mechanical [19], 2 = herbicides [5], 3 = without mechanical and without herbicides [6].

The ecological groups, established for the species with a frequency ≥ 20% and for the 50 species with the highest mutual information content, for the factors geographical situation, pH (H_2O), assimilable phosphorus and assimilable potassium, with an high equitable sampled and the highest mean mutual information, are presented in table 1.

The species *Beta vulgaris* ssp. *maritima*, *Chenopodium urbicum*, *Convolvulus althaeoides*, *Diplotaxis catholica*, *Foeniculum vulgare*, *Fumaria officinallis*, *Phalaris coerulescens*, *Picris echioides*, *Scolymus hispanicus*, *Sonchus asper* ssp. *asper*, *Xanthium spinosum* were observed only and on neutral or basic soils of Lezíria Grande but the species *Galinsoga parviflora* and *Heliotropium europaeum* were found only on acid soils of Alvalade. *Picris echioides* is a species which preferes soils with a pH(H_2O) higher than 6.5 as pointed in other crops by Vasconcelos (1984), Cerejeira (1985) and Gaspar (1992). However *Xanthium spinosum* found

Table 1 - Ecological groups for the factors geographical situation (gs) and pH (H_2O), assimilable phosphorus and assimilable potassium, and weed control

taxon	relative frequency	geographical situation 1	geographical situation 2	ecological preference pH (H_2O)	ecological groups for gs and pH	ecological preference assimilable phosphorus	ecological preference assimilable potassium	ecological groups for P_2O_5 and K_2O	weed control classes 1	weed control classes 2	weed control classes 3	ecological groups for weed control
Amaranthus blitoides	50.0	+	-	1.8	1	1.7	1.7	2	+	+	-	1.2
Amaranthus retroflexus	56.7	+	-	1.8	1	1.9	1.8	2	+	+	-	1.2
Ammi majus	43.3				#			#	-	+	+	2.3
Anagallis arvensis	83.3	+	-	1.6	1			#				#
Beta vulgaris ssp. *maritima*	50.0	+		2.0	1	2.0	1.8	2*	+	-		1.1
Chenopodium urbicum	23.3	+		2.0	1	2.0	2.0	2*	-	+		2
Chrysanthemum segetum	33.3				#	1.3	1.2	1	+		+	1.3
Convolvulus althaeoides	53.3	+		2.0	1	2.0	1.8	2*	+	+	-	1.2
Convolvulus arvensis	73.3	+	-	1.8	1	1.8	1.8	2	+	+	-	1.2
Diplotaxis catholica	40.0	+		2.0	1	2.0	1.9	2*	+	+		1.2
Echinochloa crus-galli	43.3	+	-	1.3	1	1.3		#				#
Foeniculum vulgare	60.0	+		2.0	1	2.0	1.8	2*	+	+	-	1.2
Fumaria officinalis	36.7	+		2.0	1*	1.8		#	+	+		1.2
Galinsoga parviflora	20.0		+	1.0	2*	1.0	1.0	1	-		+	3
Heliotropium europaeum	23.3		+	1.0	2	1.0	1.0	1*	-		+	3
Kickxia spuria ssp. *integrifolia*	33.3	+	-	1.8	1	1.8	1.7	2				#
Lavatera cretica	63.3	+	-	1.9	1	1.9	1.8	2	+	+	-	1.2
Lolium multiflorum	43.3	+	-	1.7	1			#				#
Paspalum paspalodes	33.3	-	+	1.1	2	1.1	1.1	1	-	-	+	3
Phalaris coerulescens	36.7	+		2.0	1	2.0	1.8	2*	+	+		1.2
Picris echoides	66.7	+		2.0	1	2.0	1.9	2*	+	+	-	1.2
Polygonum aviculare	73.3				#			#	-	+	+'	2.3
Portulaca oleracea	36.7	-	+	1.2	2	1.3	1.3	1	-	+	+	2.3
Rhaphanus raphanistrum ssp. *microcarpus*	43.3				#		2.0	#				#
Rumex crispus	60.0	+	-	1.8	1	1.8	1.7	2				#
Scolymus hispanicus	40.0	+		2.0	1	2.0	1.9	2*	+	+		1.2
Sinapis arvensis	70.0	+	-	1.8	1	1.7	1.7	2	+	+		1.2
Sonchus asper ssp. *asper*	43.3	+	-	1.9	1	1.8	1.7	2				#
Sonchus asper ssp. *glaucescens*	26.7	+		2.0	1*	1.8		#				#
Sonchus oleraceus	60.0	-	+	1.4	2	2.0		#	+	-	+	1.3
Stachys arvensis	36.7	+	-	1.8	1	1.8	1.8	2				#
Vicia sativa ssp. *nigra*	46,7				#			#	+	-		1.1
Xanthium spinosum	46.7	+		2.0	1	2.0	1.9	2*	+	+	-	1.2

Classes for: region 1 = Lezíria Grande, 2 =Alvalade ;pH (H2O)1 = acid 2 = neutral or basic; assimilable phosphorus 1 = (<200ppm), 2 = (>200ppm);assimilable potassium 1 = (<200ppm), 2 = (>200ppm); weed control 1 = mechanical, 2 = herbicides, 3 = without mechanical and without herbicides. Ecological preference pH (H_2O) – [1-1,5] = acid, [1,5 -2] = neutral or basic; assimilable phosphorus and assimilable potassium – [1-1,5] = [<200ppm],[1,5 -2] = [>200ppm]. + = corrected frequency > 100; - = corrected frequency < 100, * only, # taxon not included in 50 species with the highest mutual information content

in basic soils grows equally well in tomate crops in acid soils (Vasconcelos, 1984).

The species included in group 2 for assimilated phosphorus and potassium prefered soils with a very high content of these two nutrients (>200 ppm). Similar results were achieved by Pereira (1994) but in maize fields in Ribatejo.

The factor weed control was also included in table 1 because it indicates the influence of the implementation of CAP reform, mainly the herbicide application reduction. In the class without any type of control the species *Galinsoga parviflora*, *Heliotropium europaeum* and *Paspalum paspalodes* presented a corrected frequency higher than 100. The species included on the ecological group 1.2 indicate a preference for mechanical or chemical control.

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Resumen: Malas hierbas del girasol en Portugal. En 30 inventarios de malas hierbas en cultivos de girasol que tuvieron lugar entre Mayo y Junio de 1994 en Lezíria Grande de Vila Franca de Xira y Alvalade, 116 especies fueron observadas, distribuyendo-se en 30 familias. El perfil ecológico de las frecuencias corregidas fué calculado para 50 especies con alta información mutua para los siguientes factores: "situación geográfica", "textura", "pH(H_2O)", "pH(KCl)", "fósforo asimilable", "potasio asimilable", "materia orgánica", "drenaje del suelo", "cultivos precedentes", "control de malas hierbas", "area de cultivo", "riego", "nivel de infestación por malas hierbas. Las especies fueron agrupadas en grupos ecológicos y se determinaron sus preferencias ecológicas. Las siguientes especies *Amaranthus retroflexus, Chenopodium album, Convolvulus arvensis, Datura stramonium, Foeniculum vulgare, Lavatera cretica, Picris echioides, Polygonum aviculare, Rumex crispus, Sinapis arvensis* y *Sonchus oleraceus.* presentaron una frecuencia mayor al 50% y un promedio de abundancia mayor a 2 plantas/m^2