WEEDS ECOLOGY AND INTERFERENCE WITH *LUPINUS* CROPS IN CENTRE AND SOUTH OF PORTUGAL

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ABSTRACT

In the weed survey carried out in *Lupinus albus* crop were found 269 *taxa* concerning 253 species which 77 % were distributed in ten families. The most active environmental factors in the distribution of the species were indicated.

Weed interference effects on *Lupinus luteus* crop (cvs Refusa and Mil Fontes) were studied in two small field trials. In spite of the low efficiency of the pre-emergency herbicides applied, the results show a production reduction caused by weeds higher than 50%. In large plot trials with *Lupinus albus,* weed interference caused significant decrease in total dry matter accumulation. The reduction at final harvest (203 days after sowing) in total dry matter in the stand with weed compared with the stand with herbicide application was higher than 40%.

INTRODUCTION

A survey of weeds occurred in *Lupinus albus* crop in centre and south of Portugal was done in 1990 spring with the objective to evaluate their importance and relation with climatic and soil parameters.

The weeds influence on *Lupinus luteus* production was estimated in a small plots trial to evaluate the efficacy of different herbicides applied on the cultivar 'Mil Fontes'. A second essay was carried out to compare the weeds interference with that cultivar and 'Refusa'.

In large field plots was studied the growth of *Lupinus albus* suffering or not of the weeds interference.

MATERIAL AND METHODS

Weeds survey in *Lupinus albus* crop

The floristic surveys were done in 52 fields of Coimbra, Leiria, Santarém and Beja country-sites and climatic parameters were registered and soil samples collected for chemical and physical analysis. The method of ecological profiles, developed by Godron *et al.* (1968), was applied.

Weeds interference with *Lupinus luteus*

The first trial was carried out in an acid (pH 5.1) sandy soil, poor in organic matter (1.1%). In five completely randomised blocks was evaluated the efficacy of five active ingredients (Table 1), pre-em. and the crop production was compared with the obtained in plots with manual weeding and non weeded. The average of the total plots was 45 plants. m^{-2} plants. Also in a sandy soil with pH 6.2 and 0.8 % organic matter, a second trial was settled in a split plot with four replicates to compare the production of cultivars 'Mil Fontes' and 'Refusa'

receiving, or not, a treatment with alachlor+simazine, 4 days after the seedling. Each plot has 5 × 4 m with 10 seedling lines (30 plants. m^{-2}).

Weeds interference with *Lupinus albus*

In a loam vertisoil, the growth of the french variety 'Ares' (25 plants. m^{-2}) was studied in two large plots (4300 m^2 each) with herbicide treatment (4.5 kg a.i. of cyanazine the day after seedling) and without weeding. Each two weeks the aerial parts of 15 plants were collected to determine the dried weight of stems, leaves, inflorescences and pods, number and leaf area and plant height. In same dates the weeds species was counted and their dried weight determined in 16 squares plots of ¼ m^2.

RESULTS

Weeds distribution

The 269 *taxa* concerning 253 species were identified belonging (77%) to the following families by decreasing importance order: *Gramineae, Compositae, Leguminosae, Caryophyllaceae, Polygonaceae, Umbelliferae, Scrophulariaceae, Labiatae, Cruciferae, Papaveraceae.*

Table 1. Seed production by plot

Treatment	kg a.i./ha	Seed (g)	*
Alachlor	2.4	1746	A
Alachlor+Metribuzin	1.68+0.26	1516	A
Linuron	0.5	1653	A
Pendimethaline	1.6	1614	A
Simazine	0.5	1709	A
Manual Control	-	1527	A
Non Weed Control	-	782	-B

* Means followed by different letters are significantly different at $P \leq 0.01$, as determined by analyses of variance.

Table 2. Pods (fresh weight, g) and seeds (dried weight, g) yields, corrected by covariance for identical number of plants by plot.

		Weed control	No weed control	standard error
Mil	pods	484.4	815.3	75.1
Fontes	seeds	240.4	400.5	50.6
Refusa	pods	552.5	805.0	70.9
	seeds	263.1	379.0	19.7

Correspondent yield values of plots treated and no treated with herbicides were always significatives in the 5% level

Weeds with more than 50% of frequency, by decreasing order of abondance were: *Agrostis pourretii, Spergularia purpurea, Chamaemelum mixtum, Silene gallica,*

Chrysanthemum segetum, Polycarpon tetraphyllum, Raphanus raphanistrum, Tolpis barbata, Bromus diandrus, Anagallis arvensis and Andryala integrifolia. Species less frequents but with large recover were *Lolium* spp., *Galium spurium*, *Phalaris brachystachys*, *Juncus* spp. The most active environmental factors in the distribution of species were: mean minimum temperature, total rainfall, pH, C/N, phosphorus content, potassium content, soil texture, and coarse elements.

Weeds interference with *Lupinus luteus*

The main weeds of the first trial were *Chamaemelum fuscatum, Lolium rigidum, Raphanus raphanistrum* and *Rumex bucephalophorus*. Average seed yields in treated plots and manual weeded did not differ significantly (Table 1). Although low efficacy of the herbicides to control some weeds , the results show a production reduction caused by weeds interference higher than 50%. However it must be emphasise the higher density of seedling practicable. The yields on the second trial (Table 2) confirms the appreciable interference effects and showed a stronger competition capacity of the 'Refusa' variety compared with the 'Mil Fontes'. The dominant weeds were *Chamaemelum mixtum, Rumex bucephalophorus, Spergula purpurea, Papaver pinnatifidum, Raphanus raphanistrum, Silene gallica, Arctotheca calendula, Lolium rigidum.*

Weeds interference with *Lupinus albus*

A similar of the last refered trial was carried out with *Lupinus albus* varieties 'Estoril' and 'Ultra' but was abandoned on account of intense plant damage caused by rodents and birds. The detailed results concerning the evolution of growth characteristics like the relative growth rate, leaf area ratio, specific leaf area, leaf weight ratio, net assimilatory rate, leaf area index and crop growth rate of the plant crop on the large plot trial are presented in Gaspar (1992). The total above ground dry matter production of *L. albus* grown in competition with weeds were significantly higher than in the stand with herbicides (Fig. 1).

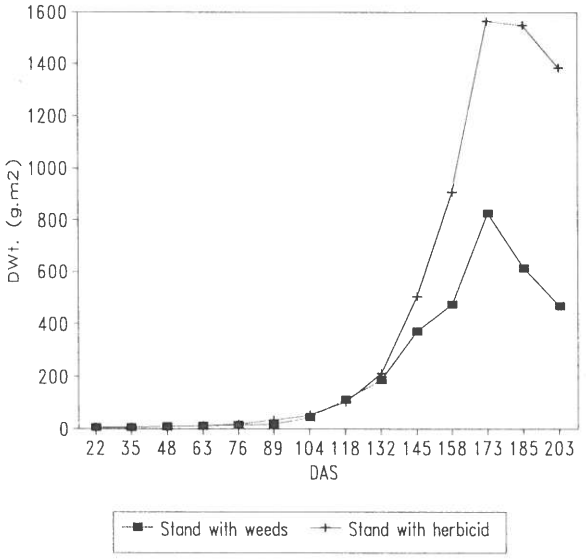

Figure 1. Evolution of total above ground dry matter accumulation of *L. albus* grown in stand with weeds and in stand without weeds

Calculated as percentage of above ground biomass of *L. albus*+weeds (Fig 2) the treatment with herbicide decreased less than 10 %, after 89 DAS (days after sowing). While in the stand without herbicide the dry matter production of *L. albus* decreased after 35 DAS for 40 % till 104 DAS, and after that maintain the values between 50 and 70% (Fig. 2). The final harvest of all the area of the trial has given the grain yield of 270 and 430 kg, respectively, for the stands with weeds and stands with herbicide.

The six major species were *Medicago nigra, Melilotus segetalis, Papaver rhoeas, Phalaris brachystachys+Phalaris coerulescens, Raphanus raphanistrum, Sinapis arvensis.*

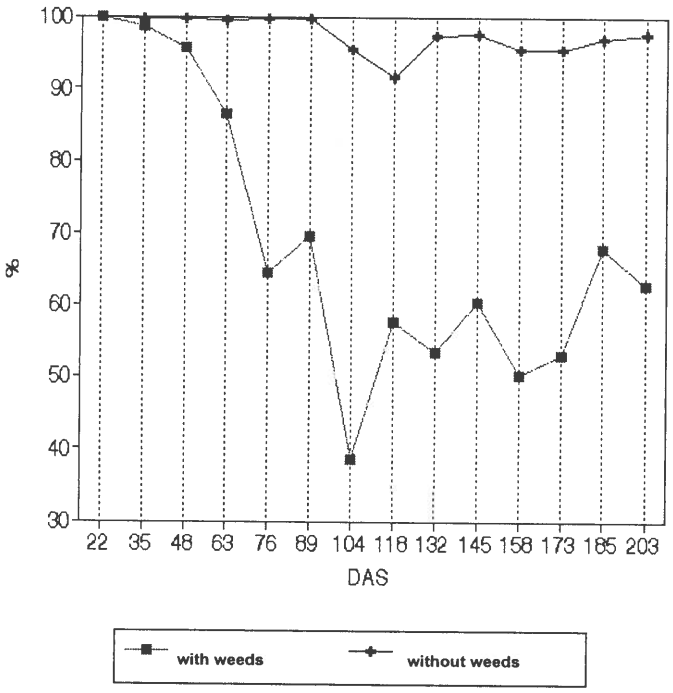

Figure 2. Percentage of aerial biomass of *L. albus* in relation with aerial total biomass (*L. albus*+weeds=100%), by unit of area.

REFERENCES

Gaspar, N. 1992 - Infestantes em tremoceiro (*Lupinus albus* L.). Ecologia e concorrência. Diss. Mestrado Produção Vegetal. Inst. Sup. Agron. Lisboa.

Godron, M. J.; Dajet, Ph.; Emberger, L.; Long, G.; De Floc, H. E.; Poisonet, J.; Sauvage, C. and **Wacquant, J. P. 1968** - *Le relevé d'inventaire écologique de la végétation et du milieu.* Centre National de la Recherche Scientifique. Paris.