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Preliminary results on autochthonous populations of *Lolium rigidum* Gaud. from Aragón (Spain)

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SUMMARY - Variability and productivity of 13 autochthonous populations of *Lolium rigidum* Gaud. from Aragón were studied in order to use this species as an self-reseeding annual grass. Populations were compared to three foreign *L. rigidum* and four *L. multiflorum* Lam. cultivars during the 1995-96 period. The study was carried out under isolated plant and microplot conditions. Results proved the small variability between the autochthonous populations and their forage potentiality close to the control cultivars.

Key words: Ray-grass, autochthonous populations, forage yield, reseeding, rain-fed land.

RESUME *- "Résultats préliminaires dans des populations autochtones de* Lolium rigidum *Gaud. provenant d'Aragon (Espagne)". On a étudié la variabilité et la productivité de* Lolium rigidum *Gaud. chez les populations autochtones d'Aragon à l'objet de l'utiliser comme une espèce fourragère annuelle d'autoressemis. L'étude a été faite sur 13 populations de différentes localités de la région sous conditions de plante isolée et microparcelle. Les populations ont été comparées avec trois étrangers et avec quatre cultivars de Lolium multiflorum Lam., pendant la période 1995-96. Les résultats ont prouvé la faible variabilité entre les populations autochtones ainsi que leur bon rendement fourrager proche aux témoins.*

Mots-clés : *Ray-grass, populations autochtones, production fourragère, ressemis, terrain sec.*

Introduction

Lolium rigidum Gaud. is an allogamous annual grass from the Mediterranean area, but widespread in the world and grown for forage use in some places of Australia and Italy (Terrell, 1968; Bullitta, 1976). In Aragón, it is considered a weed which is difficult to eradicate from cereal crops but an excellent forage plant in fallows (Montserrat, 1956); their forage suitability has been recently proved in field experiments (Delgado and Andrés, 1996). This plant shows an early establishment with the first autumn rainfall, winter growing ability and suitability to threshing, thus making it an interesting species for self-reseeding pastures (Perez and Madueño, 1954). When *L. rigidum* is observed growing spontaneously in the field, it shows a large variability concerning growing habit, appearance and dry matter yield which is unknown whether it is due to this species variability or to the environmental conditions.

The aim of these experiments was to study the variability and the forage yield of those populations growing in Aragón.

Material and methods

Thirteen *L. rigidum* populations collected at different sites in Aragón in June 1995 were studied. The collection was seeded at Zuera (Zaragoza) on a loamy-sandy texture, basic Ph and low fertility soil during the season 1995/96. The weather conditions during the experiment were: 1.4 and 28.2°C maxima and minima monthly mean temperatures; -5°C absolute extreme temperature; and 462.9 m total rainfall in the September 95/June 96 period.

Populations were studied on individual plants and in micro-plots. When studied on individual plants, rows of 12 plants per population and repetition were established at 0.6 m distance within the row and 0.6 m between rows; the statistical model was randomised blocks with four replications. In microplots,

one 1.5 m row/population was seeded 0.25 m distance between rows, at a rate of 15 kg/ha; the statistical design was randomised blocks with three replications. Autochthonous populations were compared with three foreign ones: 'Terreblanche' (from the Institut National de la Recherche Agronomique de Montpellier, France), 'Sassari' (Istituto per la Colture Foraggere de Sassari, Cerdeña) and 'Wimmera' (a cultivar from Australia), as well as two cultivars of *L. multiflorum* var. *westerwoldicum*: 'Promenade' and 'Agraco 812' and two of *L. multiflorum* var. *italicum*: 'Serenade' and 'Tetila'. The data, date (in parenthesis) and score were the following:

In individual plant

(i) Number of tillers/plant (8.04.96): <5=1; 6-10=2; 11-15=3; 16-20=4; >20=5.

(ii) Growing habit at heading (6.05.96). Angle respect to the soil: <15°=1; 16°-30°=2; 31°-45°=3; 46°-70°=4; 71°-90°=5.

(iii) Height at heading (6.05.97): number of centimetres.

(iv) Measures (length/width) of the basal leaves (6.05.96): 9.1/5.0 cm=1 (small); 12.5/6.2 cm=2 (medium); 17.5/8.6 cm=3 (large). The measures of length and width of the leaf correspond to the average of ten leaves gathered from ten plants scored 1, 2 or 3.

(v) Number of spikes (13.05.96): number/plant.

(vi) Dry matter weight (14.05.96): grams/plant.

In microplots

DM yield in a central 1 m row, eliminating 0.25 m as borders. Three cuts were made in 24.04.96, 20.05.96 and 26.06.96 dates.

Results and discussion

The statistical analysis of the results showed the presence of highly significant differences ($P<0.001$) in all the analyzed characters. These differences were evident overall between species when the comparison of means was analyzed. Differences, however, were not significant ($P>0.05$) in general, if populations or cultivars were analyzed within each species. Means reached by the autochthonous populations were very similar to those obtained by populations or cultivars of foreign origin (Table 1). Scores and measures were the following:

(i) Number of tillers/plant: The higher score was reached by *L. rigidum*, 2.4 ± 0.17 *vs* 1.6 ± 0.19 of *L.multiflorum* (on 5 points, from the lowest to the highest).

(ii) Plant growing habit: *L. multiflorum* var. *westerwoldicum* was the most erect, followed by *L. multiflorum* var. *italicum* and *L. rigidum* the most prostrated, being the respective scores: 3.1 ± 0.16; 2.4 ± 0.05 and 1.8 ± 0.35 (on 5 points, from the least to the most erect).

(iii) Date at full heading : The date of heading was very similar in the different populations and cultivars within each species. *L. rigidum* reached full heading on 13th May and *L. multiflorum* on 27th May.

(iv) Plant height at heading: Cultivars of *L. multiflorum* were outstanding with 23.9 ± 2.01 cm with respect to the height reached by *L. rigidum* of 19.8 ± 1.62 cm.

(v) Size of the basal leaves: The largest size corresponded to *L. multiflorum* with 2.3±0.23 points *vs* 1.6±0.16 of *L. rigidum* (on three points, from the lowest to the highest).

(vi) Number of spikes/plant: The number of spikes was lower in *L.multiflorum* with 14.9±2.02 spikes/plant *vs* 27.7±3.51 spikes/plant in *L. rigidum*.

(vii) Dry matter weight/plant: The highest DM weight corresponded to the cultivars of *L. multiflorum* with 27.6±5.91 g/plant *vs L. rigidum* which reached 22.1±2.61 g/plant.

(viii) Dry matter yield in microplots: DM yield in the total of cuts was 7104±1256 kg/ha in *L. multiflorum* and 5096±660.4 kg/ha in *L. rigidum*. Cultivars of *L. multiflorum* var. *westerwoldicum* stood out significantly with 8092 kg/ha. Forage yield was constant in the three cuts in *L. multiflorum* and was decreasing in *L.rigidum* according to the order of the cuts.

Table 1. Means and ranges of the 20 accessions for each character evaluated

Accession	0,6 x 0,6 m individual plant						Microplot		
	Tillering[a]	Growth habit[a]	Plant length (cm)	Leaf size[b]	Spikes/ plant	Plant weight (g)	1st cut (g/m^2)	2nd cut (g/m^2)	3rd cut (g/m^2)
1. Caspe	2.25	1.93	18.7	1.48	26.1	21.1	170.8	172.8	116.0
2. Bajo Aragón	2.35	1.83	17.9	1.53	26.5	19.4	--	--	--
3. Zaragoza	2.35	2.20	21.8	1.93	35.2	24.6	171.2	152.5	116.0
4. Monegros	2.35	2.63	22.1	1.43	30.8	21.8	233.2	210.8	116.0
5. Ejea	2.23	1.58	19.5	1.48	24.8	26.2	167.2	162.0	116.0
6. Ejea	2.58	1.93	20.3	1.55	28.5	22.2	238.4	201.2	116.0
7. La Litera	2.60	1.93	22.2	1.63	29.7	22.8	190.8	169.6	116.0
8. La Almunia	2.38	1.68	19.2	1.65	25.2	18.4	150.8	206.4	116.0
9. Borja	2.50	2.20	19.4	1.53	29.1	19.6	213.6	168.4	116.0
10. Calatayud	2.25	2.20	22.2	1.88	33.8	26.3	--	--	--
11. Montalban	2.30	1.60	17.5	1.43	25.3	19.7	--	--	--
12. Daroca	2.43	1.73	20.2	1.55	28.2	25.1	172.4	123.6	116.0
13. Jiloca	2.05	1.45	17.9	1.93	27.7	18.2	187.2	248.8	116.0
Sassari	2.38	1.50	19.2	1.63	21.4	23.3	228.8	236.8	116.0
Terreblanche	2.70	2.60	20.6	1.58	25.5	23.6	221.6	228.0	116.0
Wimmera	2.18	1.63	18.0	1.53	25.5	20.9	286.4	202.8	116.0
Agraco-812	1.63	3.18	26.5	2.30	16.3	32.3	356.0	273.6	241.6
Promenade	1.40	2.95	24.2	2.65	14.2	31.2	165.6	220.0	241.6
Serenade	1.50	2.35	21.7	2.10	12.3	19.3	171.2	182.8	241.6
Tetila	1.89	2.42	23.4	2.33	16.7	27.8	286.8	219.2	241.6
Mean	2.06	2.05	20.6	1.75	25.1	23.2	212.4	198.8	145.6
Maximum	2.70	3.18	26.5	2.65	35.2	32.3	356.0	273.6	241.6
Minimum	1.40	1.45	17.5	1.43	12.3	18.2	150.8	123.6	116.0
L.S.D. (P<0.05)	0.378	0.341	2.01	0.242	5.60	5.45	140.40	105.6	--

[a] Score 1-5; [b] Score 1-3.

Results show a very similar behaviour between the different populations of *L. rigidum* when compared under homogeneous environmental conditions and water stress, in contrast to the variability observed by Monserrat (1956) when studying the flora from Aragón. The largest variability was seen in some characters such as the growing habit and the forage yield that would lead us to a breeding process.

Forage yield was high, in agreement with the results from other trials by Bullitta (1976) and Delgado and Andrés (1996). *L. multiflorum* cultivars showed a good response under water stress conditions and higher yield than *L. rigidum*, specially var. *westerwoldicum,* due to its higher yields in the second and third cuts. Therefore, it would be advisable to develop new studies to confirm the adaptation of *L. multiflorum* to this environment as well as their capacity for self-reseeding.

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