

BIOLOGICAL, PRODUCTIVE AND QUALITATIVE EVALUATION OF PERMANENT MEADOWS IN SOUTHERN ITALY

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Abstract

In the four-year period 1992-95 the biological and productive capabilities of two pure permanent meadow species, sainfoin (*Onobrychis viciaefolia* Scop.) and cocksfoot (*Dactylis glomerata* L.), subjected to three harvest times (when plant height reached 10, 15 and 20 cm) and two cutting heights (0 and 5 cm) were tested under dry conditions. Sainfoin adapted better to environmental conditions than cocksfoot and proved to perform better in terms of number of annual cuttings, green forage and dry matter production and persistence throughout the years. Among the harvest times and cutting heights, the best responses were obtained, respectively, in the 15 cm treatment and in cutting close to the ground.

KEYWORDS

Sainfoin, cocksfoot, harvest times, cutting heights, production.

INTRODUCTION

In Apulia region (Southern Italy), forage growing, mostly made under dry conditions or with limited water supply, is characterized by production that is variable through the years and not very satisfactory, due to both the type of the soils concerned (shallow and poorly fertile), and to the climatic conditions (rainfall variable from year to year and mostly occurring in the winter months, very high maximum temperatures in summer). In this situation, it may be interesting to identify species that can adapt well to different environmental conditions, thus enhancing the less favoured areas. On the basis of previous experiments (Rizzo *et al.*, 1985; Maiorana *et al.*, 1986; Maiorana *et al.*, 1995), this research was designed to study the biological and quanti-qualitative characteristics of two pure permanent meadow species, a leguminous and a grasses crop, that are hardy, low nutrient demanding and drought resistant.

EXPERIMENTAL

The research was carried out from 1992 to 1995 at Rutigliano (41° 01' latitude N, 17° 06' longitude E, 122 m a.s.l.), on the Experimental Farm of the Institute. The soil is a Rhoxeralf Lithic Ruptic (Soil Taxonomy USDA), with total N = 0.134%; available P (as P₂O₅) = 51 ppm; exchangeable K (as K₂O) = 715 ppm; organic matter = 2.37%. The climate is classified as "accentuated thermomediterranean" (Unesco-FAO classification). Three harvest times (on the average, at 10, 15 and 20 cm of plant height) and two cutting heights (close to the ground and at 5 cm) were compared on sainfoin (*Onobrychis viciaefolia* Scop., cv. Vala) and cocksfoot (*Dactylis glomerata* L., cv. Dora), grown as dryland crops. A split-plot design, with three blocks, was applied on plots of 6 m²; the sowing of both species was effected in autumn 1991, with a row spacing of 15 cm, using 80 and 50 kg of seed per ha for the legume and grasses, respectively. The green forage production was determined on the whole plot area; the contents of dry matter (after oven-drying at 105° C), crude protein and neutral detergent fibre (NDF) (at 80° C) were measured later on green samples. Statistical analysis of data was made by ANOVA, according to GLM procedure of SAS/STAT program.

RESULTS AND DISCUSSION

During the four-year trial period, the annual rainfall, even though characterized by values almost always lower than the long-term average 1977-1991 (618.3 mm vs. 458.9, 511.4, 468.8 and 714.4 mm of 1992, 1993, 1994 and 1995, respectively), showed a better

monthly distribution; in fact, in the March-July period, the most important for the effects that the rain can have on the number of cuttings, very effective rains were observed in April (81.8 mm) and June (79.0 mm) 1992; in March 1993 (93.8 mm); in June (59.2 mm) and July (41.2 mm) 1994 and in March 1995 (108.8 mm).

In these conditions, it was possible to harvest a good number of cuttings every year, from the end of March - start of April to June, sometimes till late July (1992 and 1994), which is unusual in the trial environment.

The results obtained by the two species tested are reported in tables 1 and 2. Their analysis points out that in sainfoin (Table 1) the best responses were achieved in 1993, whether for green forage (31.3 t ha⁻¹) and dry matter production (6.5 t), or for protein content (23.2%), with statistically significant differences; this confirms its ability to obtain the best yields in the second year after sowing. The results of 1994 and 1995 were generally satisfactory. Among harvest times, the most interesting were for all parameters those made at 15 and 20 cm height, although characterized by significantly lower protein contents; between cuttings heights, the best was that close to the ground.

The cocksfoot (Table 2) showed good green forage and dry matter yields in the first year (10.2 and 2.3 t ha⁻¹, respectively), sufficient ones in the third year (7.8 and 2.1 t), and very low productions in the two remaining years, since the grasses, which are slow to resume vegetative cycle after the winter break, have not made use of the plentiful rainfall that occurred in March. As to cutting times and heights, their evolution in cocksfoot seemed similar to that of sainfoin.

CONCLUSIONS

The results obtained in the four-year study showed the following:

1. Sainfoin is well-adapted to the climatic conditions of the trial environment; it was earlier than the cocksfoot in resumption of the vegetative cycle after the winter break, so that the first cuttings were effected in the second, third and fourth years at late March, 18 to 32 days earlier than the grasses; it reached a good number of cuttings in the four trial years (3, 4, 5 and 5.3, on the average); it provided good green forage and dry matter productions and high protein contents; it showed a quite good persistence over time with yields that in the fourth year were slightly lower than those observed in 1994.
2. Cocksfoot, instead, did not tolerate the prolonged drought periods well; it seemed to be later than the sainfoin; except in the first year, it showed a low number of cuttings (5, 1.3, 3 and 3, respectively in the four years) and unsatisfactory green and dry yields; it also showed, starting from the third year, a poor persistence capacity, with 30-45% of plants remaining in the field.
3. For harvest times, in both species, the highest green forage and dry matter productions were obtained with the cuttings at 15 and 20 cm height; whereas, the highest protein content was found at 10 cm. As a whole, the cutting at 15 cm seemed to be the best, achieving a good balance between quantity and quality of production.
4. The cutting at 0 cm provided in the four years the highest mean values of green forage and dry matter, both in sainfoin and cocksfoot, but in last two years, in the plots submitted to this cutting, some missing plants were observed and the most interesting responses were mostly obtained in the cutting at 5 cm.

Therefore, the latter made up for the lowest mean productions with greater yield capacity over time (i.e. in 1995 it achieved a green yield of 21.7 t per ha vs. 17.1 t with cutting close to the ground in sainfoin and 1.9 vs. 1.7 t, respectively, in cocksfoot; this was probably because of a greater accumulation of storage substances in the roots, which are essential to get through the autumn-winter period and to ensure a luxuriant growth in springtime.

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Table 1

Quanti-qualitative parameters of sainfoin.

	Green forage (t ha ⁻¹)	Dry matter (t ha ⁻¹)	Protein content (%)	NDF content (%)
YEARS				
1992	14.3 b	3.4 c	19.0 b	24.9 c
1993	31.3 a	6.5 a	23.2 a	30.2 b
1994	19.8 b	4.8 b	18.7 b	29.7 b
1995	19.4 b	4.4 b	15.9 c	34.2 a
HARVEST TIMES				
10 cm	18.3 b	4.1 b	20.7 a	29.0 b
15 cm	22.4 a	5.1 a	18.8 b	30.0 a
20 cm	22.9 a	5.1 a	18.1 c	30.2 a
CUTTING HEIGHTS				
0 cm (close to the ground)	22.1 a	5.0 a	19.1 a	29.8 a
5 cm	20.3 b	4.6 b	19.3 a	29.5 a
MEANS	21.20	4.78	19.20	29.75

Student - Newman - Keuls test (p - 0.05).

Table 2

Quanti-qualitative parameters of cocksfoot.

	Green forage (t ha ⁻¹)	Dry matter (t ha ⁻¹)	Protein content (%)	NDF content (%)
YEARS				
1992	10.2 a	2.3 a	17.1 a	45.4 b
1993	2.4 c	0.7 b	8.6 d	49.2 a
1994	7.8 b	2.1 a	15.2 b	49.0 a
1995	1.8 c	0.5 b	13.5 c	50.9 a
HARVEST TIMES				
10 cm	5.1 a	1.3 b	14.4 a	47.3 c
15 cm	5.7 a	1.5 a	13.2 b	48.6 b
20 cm	5.8 a	1.4 a	13.2 b	50.0 a
CUTTING HEIGHTS				
0 cm (close to the ground)	6.2 a	1.5 a	13.8 a	48.3 b
5 cm	4.9 b	1.3 b	13.5 a	49.0 a
MEANS	5.55	1.40	13.60	48.63

Student - Newman - Keuls test (p - 0.05).