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Summary : Ten tropical crops (four grasses : *Chloris gayana* Kunth, with three cv., and *Sorghum almum* ; six leguminous : *Dolichos lablab* L., *Medicago scutellata* Mill., *Stylosanthes scabra* L., *Desmodium intortum* Urb., *Cassia trora* L. and *Glycine spp.*) have been introduced and grown in the "Murgia" hilly area (Apulian region) to test their adaptation capacity to the unfavourable soil and climatic conditions of that area. *Sorghum almum* and *Medicago scutellata* were shown to be the best, with dry matter yields of 9.1 t ha^{-1} (two-year average) and 11.5 t, respectively, and satisfactory crude protein and neutrodetergent fibre (NDF) contents. *Chloris gayana* and *Dolichos lablab* were at an intermediate level, whereas the six remaining species showed very low emergence rates.

Key-words : tropical species, adaptation, yields, quality.

INTRODUCTION

In Apulia (Southern Italy) there are two large areas in which the forage crops can spread, i.e. the "Tavoliere", mostly flat and with fertile soils, in which forage resources are provided by forage crops and perennial or rotational meadows, and the "Murgia", a hilly area crossing nearly the whole region from NW to SE, ranging in elevation between 250 and 600 m ; its climate is usually characterized by low rainfall, mostly occurring in autumn-winter months ; its soils are poorly fertile and deep, particularly at the highest elevations, and permanent pastures are the only forage source.

In the "Murgia", small family-run sheep breeding is quite spread, and grazing cannot fully meet feed requirements due to the frequent production gaps, both in summer and winter.

The study of new, hardy, poorly nutrient-demanding and drought-resistant forage species which could somewhat fill these gaps, is dealt with in this note.

MATERIALS AND METHODS

The research, started in 1993, is being conducted in the "Agostinelli" farm of the Institute, close to Rutigliano (41° 01' latitude, 4° 39' longitude, 122 m a.s.l.), in a piedmont area in the "Murgia", on a clay soil (55.2%), classified as Rhodoxeralf Lithic Ruptic (Soil Taxonomy - USDA, 1975), supplied with low nitrogen (0.13%, as N) and organic matter levels (1.65%), a satisfactory available phosphorus content (57 ppm, as P_2O_5) and a water field capacity near to 32% on a soil dry weight basis.

The results obtained in the two year period 1993-1994 are reported hereby.

Ten commercial varieties supplied by the C.S.I.R.O., Division of Tropical Agronomy, S. Lucia, Brisbane, Australia, including four perennial grasses (*Chloris gayana* Kunth, cv. Callide, cv. Katambora and cv. Pioneer ; *Sorghum almum* Parodi, unidentified cv.) and six leguminous, including three annual (*Dolichos lablab* L., cv. Highwort ; *Medicago scutellata* Mill., cv. Kelson ; *Stylosanthes scabra* L., cv. Seca), one perennial (*Desmodium intortum*

Urb., cv. Greanleaf) and two others, the classification of which is uncertain (*Cassia trora* L., cv. Wynn and *Glycine ssp*, cv. Tinaroo).

The pre-established amounts of seeds were 4 kg ha^{-1} for *Chloris*, 10 kg for *Sorghum*, *Cassia*, *Desmodium*, *Glycine*, *Stylosanthes*, 20 kg for *Medicago* and 30 kg ha^{-1} for *Dolichos*. However, the germinability of different cultivars being very low (6% in *Stylosanthes*, 10% in *Cassia*, 30% in *Glycine*, for leguminous ; ranging between 20% in *Chloris gayana* cv. Pioneer and 65% in *Sorghum almum*, for grasses), the amounts of seeds actually used were determined based on different germination rates.

At the ploughing, a phosphatic fertilization was provided by 100 kg ha^{-1} of P_2O_5.

Sowing was effected on 2nd June 1993 on 4 rows 50 cm apart, in 4 m^2 plots ; for some species, as pointed out in the results, it was repeated on 9th July, with three additional rows being added to those previously set. In both cases, a post-sowing irrigation was applied, with a watering volume of 300 $m^3.ha^{-1}$.

After emergence, 40 $kg.ha^{-1}$ of N were applied, only on grasses, in the nitric form together with an additional irrigation to ensure a better fertilizer use by plants.

In the field plot distribution, a randomized block experimental design was applied, with three replicates.

At harvest, the green forage yield was determined and two samples were taken for the dry matter content determination (after oven-drying at 105 °C till constant weight) and for the chemical analyses (crude protein and neutrodetergent fibre, NDF), after oven-drying at 80 °C.

In the trial area the weather, classified as "accentuated thermomediterranean" (Unesco-FAO classification), was characterized, in the two-year period 1993-94, by rainfall always below 608.3 mm, observed in the previous reference period 1977-1992, with a deficit of 96.9 and 139.5 mm, respectively for the two years. Moreover, temperatures were always higher than those observed in the period 1977-1992, with mean monthly values higher of about 0.5 °C in 1993 and 1.1 °C in 1994.

RESULTS AND DISCUSSION

For a better comparative analysis of tropical species, their yield responses were confronted with those of two species quite spread in less marginal areas of "Murgia", i.e. cocksfoot (*Dactylis glomerata* L.) and sainfoin (*Onobrychis viciaefolia* Scop.), tested in the same experimental farm and in the same years, but in another experimental trial ; so, their results were not submitted to a common statistical analysis.

Some of the tested species, mostly those with a low germinability (two out of the three *Chloris*, *Cassia*, *Desmodium*, *Glycine* and *Stylosanthes*), showed a very poor or no emergence after the first sowing, although the amount of seeds had been increased ; it was thus necessary to effect, as previously explained, the second sowing about one month after the previous one. But in that case too no improvement was observed, total emergence rates being between 5 and 10% in *Chloris* and in *Glycine* and below 5% in *Cassia*, *Desmodium* and *Stylosanthes*.

The emergence rates of one of the three *Chloris* (cv. Katambora) and of *Sorghum* among grasses, of *Dolichos* and *Medicago* among leguminous, were satisfactory with values ranging from 85 to 90%.

For *Chloris* and *Sorghum*, that are perennial species, in the first trial year, in which sowing was effected, a single cut was performed, in autumn, when 50% of plants had already reached full flowering, whereas in 1994, three cuttings were effected starting from May, every 25 days, as plants reached a mean height of 40-50 cm.

Figure 1, where the main quantitative and qualitative characteristics of the two grasses are reported, shows the sharp superiority of *Sorghum* for green forage and dry matter yields in both trial years, with differences which proved to be always significant.

The mean values, observed in the two-year period, are indeed 25.7 and 9.1 $t.ha^{-1}$ for *Sorghum*, 5.0 and 1.6 t. for *Chloris* for the two above parameters. The superiority of

Sorghum is not evident in terms of crude protein and fibre, for which, the most satisfactory values were found in *Chloris*, even though with very low differences, which were significant only for the protein obtained in 1993.

In the two annual leguminous, *Dolichos* and *Medicago*, the cutting was effected in autumn 1993, when 50% of plants were at the start of pod-formation stage.

The best yields (fig.2) were provided by *Medicago*, with 30.0 t.ha^{-1} of green forage and 11.5 t of dry matter, against 18.0 and 6.9 t.ha^{-1}, respectively, of *Dolichos*. Instead, as to quality parameters, the protein content was always higher in *Dolichos*, whereas fibre values (NDF) were practically the same in the two species.

CONCLUSIONS

The results obtained in this research have pointed out a good adaptation capacity for some of the tested species and the possibility to introduce them in difficult areas. Indeed, the responses of *Sorghum almum*, in accordance with the results obtained by Corleto et Cazzato (1990), and of *Medicago scutellata* may be considered to be very interesting and in agreement with those of other species, such as sainfoin and cocksfoot, grown in more favourable areas, at least in terms of yields, with satisfactory crude protein and NDF contents. Equally interesting, although to a lower extent, the performances shown by *Chloris gayana* and, above all, by *Dolichos lablab*.

Results have been appreciable considering the unfavourable climatic pattern observed in the two-year test period - very critical especially due to rainfall which was even below the poor values recorded in the previous reference period - as well as the difficult experimental conditions, (in particular from a nutritional perspective), under which species had been deliberately tested.

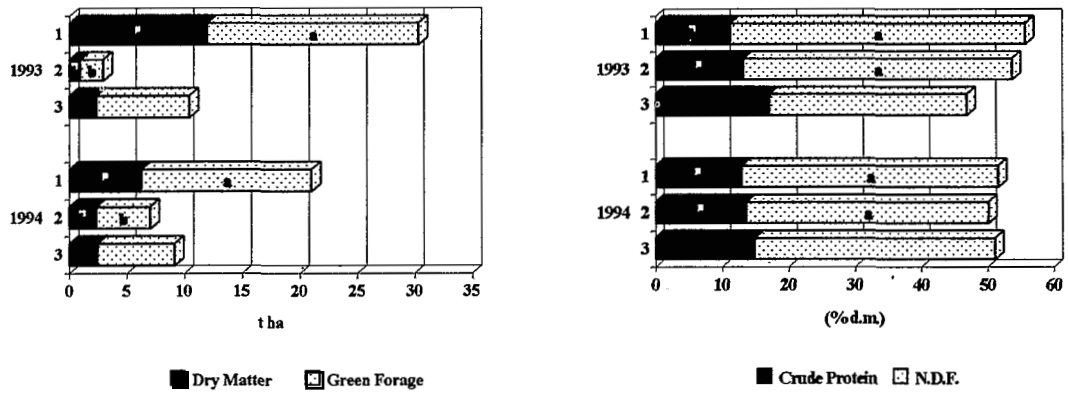

Figure 1 - Quanti-qualitative parameters of Sorghum almum *(1),* Chloris gayana *(2) and* Dactylis glomerata *(3).*

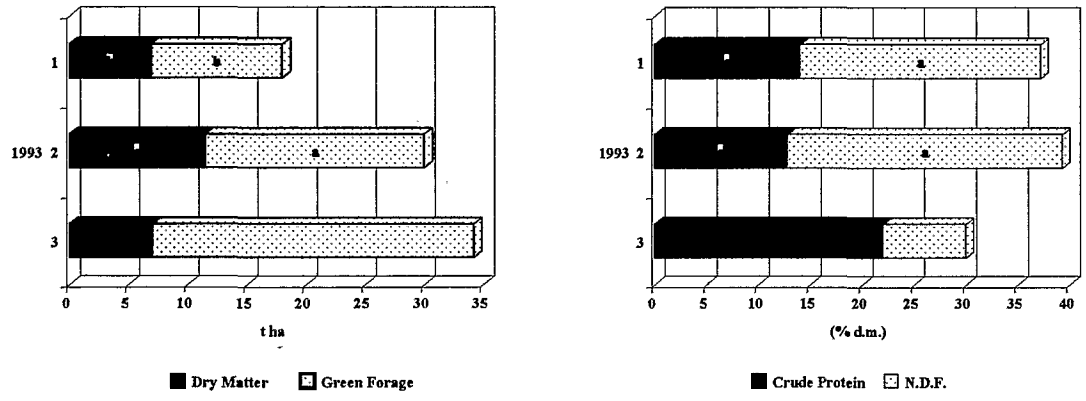

Figure 2 - Quanti-qualitative parameters of Dolichos lablab *(1),* Medicago scutellata *(2) and* Onobrychis viciaefolia *(3).*

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Authors have equally contributed to this work.

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