APPLICATION OF N AND P FERTILIZERS ON PASTURE OF SOUTHERN ITALY: EFFECTS ON FORAGE SPECIES, PRODUCTION AND QUALITY

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ABSTRACT

The effects of N and P fertilization on the productive and qualitative characteristics of improved pastures in inside Southern Italy areas were investigated. The trial was carried out in two sites characterized by different altitude above sea level and soil properties; also previous fertilization treatments and botanical composition characteristics are significantly different. The N fertilization reduced negative effects of climatic variations (typical of these areas) on botanical composition of "Bella" grassland at lower altitude. On the contrary a more stable botanical composition assured good yields and quality of forage at "Li Foy" field (higher a.s.l.) because more regular weather conditions were recorded. The botanical composition of inside grasslands of Southern Italy plays an important role on forage yield and nutritional value, as determined by chemical analyses of crude protein and fibre.

KEYWORDS

Botanical composition, inside grasslands, crude protein, climatic variations

INTRODUCTION

Nitrogen fertilization, in Mediterranean climate, constitutes a unique tool to improve the quanti-qualitative production of the natural pastures within the limits ranging from soil and climate potentialities (Demarquilly, 1970; Landi, 1980; Arnaux *et al*., 1983; Ziegler and Viaux, 1984). In fact the production of pastures, without N fertilization is a function of organic soil N mineralization (low limit) while the production in conditions of non limiting N is dependent on climatic conditions (high limit). The phosphatic fertilization has a greater effect on soils with low P contents and where the presence of leguminous species is predominant (Demarquilly, 1977). Numerous studies have been conducted on this topic in Italy (Lanza, 1953; Cavazza, 196G; Rivoira, 1976). Generally the botanical composition of the grasslands of the central Southern Italy areas has varied with factors such as environment and anthropic differences. Also nutritional quality depends upon grass chemical composition and upon contribution of species present in the pastures. For this reason, to study the possibilities of yield recovery of some grasslands and the role played by single species on yield and qualitative performances both yield and botanical composition of grassland must be considered. In this paper were investigated the effects of fertilization on the productive and qualitative characteristics of improved pastures in central Southern Italy.

METHODS

The trial was carried out for two years at the experimental farms of Bella and Li Foy (Potenza, Southem Italy). The Bella's field is 400 m above sea level and was used for meadow-pasture for around 20 years and manured annually with 40 kg P_20_5 ha^{-1}. The experimental field of Li Foy is 1200 m above sea level on a soil used for meadow-pasture for 25 years and manured annually with 40 kg P_20_5 ha^{-1}. The soils, classified by Soil Taxonomy (USDA, 1975) respectively as Typic Palexeralf (Bella) and Typic Xerochrept (Li Foy) were characterized (Lopez ,1987) by high soil water retention capacity, 35% of clay and differing contents in $NaHCO_3$-extractable P (respectively 40 vs 100 mg P_20_5 kg^{-1}). A randomized blocks design with three replications was used to compare 4 treatments (N_0 P_0, N_0 P_{60}, N_{80} P_0, N_{80} P_{60}) and two cutting managements: i) at 20-25 cm of height of the vegetation; ii) at 50 % of flowering of the leguminous species (harvest cutting). In this paper only the results obtained at 50% flowering were reported. After recording yield (d.m.) and yield components, forage samples were collected from each plot and crude protein (CP), crude fibre (CF) and nutritive value (UFL= French milk forage units - INRA, 1980) were determined. Botanical composition characteristics are significantly different in the two experimental fields. In the 1st locality (Bella) were present *Lolium perenne*, L. (Perennial Ray-grass=PRG), *Festuca arundinacea*, S. (Tall fescue=TF), *Poa Pratensis*, L. (Kentucky bluegrass=KB), *Trifolium repens*, L. (White clover=WC); in the 2nd one (Li Foy): *Bromus arvensis*, L. (Bromegrass=BG), *Dactylis glomerata*, L. (Orchard-grass=OG), *Lolium perenne*, L. (Perennial Ray-grass=PRG), *Trifolium repens*, L. (White clover=WC), *Phleum pratense*, L. (Timothy=TM), *Poa Pratensis*, L. (Kentucky bluegrass=KB). On the selected species from each plot were determined specific relative contributions (as %) to d.m. production, protein, crude fibre contents and nutritive value (UFL ha^{-1}).

RESULTS AND DISCUSSION

Fertilizing treatments affected d.m. yield and qualitative characteristics of the forage as mean of two experimental sites (Table 1. 3rd column). Statistical analyses show however, that the effect of the fertilization was significant, supplying both N and P fertilizers. In fact the values of protein and UFL ha^{-1} were positively influenced from the N and P fertilization (i.e.: UFL is higher with $N_{80}P_{60}$).

Some differences in the average yields of 2 years were observed between the two experimental areas (Bella and Li Foy) when the plants were cut at 50 % of flowering of forage legumes. The "Li Foy" field produced higher protein content and UFL production than the "Bella" field. The d.m. yield and UFL ha^{-1} of the untreated plots were higher in this site (Table 1). Furthermore lower responses of "Li Foy" sward to the experimental treatments, compared with responses in the "Bella" field were observed. This trend presented by the yield, quality of forage, and UFL ha^{-1} (Table 1) was probably dependent on the higher soil N, o.m. and $NaHCO_3$-extractable P contents (Lopez, 1987) recorded at "Li Foy" in comparison to the soil sampled at "Bella" field. In this last site because the available nutrients of the soil were poor, yield potentialities were lower and better responses to fertilizers were observed.

The relative contribution of forage species (as %) to d.m. production, protein and crude fibre contents were affected by fertilizer treatments, but in strong interaction with experimental sites. Figure 1 shows contributions of differing species to d.m. production in the two sites. It appears that in the 1st site (Bella) white clover (*Trifolium repens* L.) represents the species more influenced by fertilizer treatments (i.e.:contribution to d.m. yield changes from 16.5 with N_0P_0 to 24.5% with N_0P_{60}) with a d.m. yield higher than 0.9 tons ha^{-1}. Moreover white clover contributes more than 50% to protein content in both the years with N_0P_{60}. On the contrary in the 2nd site (Fig. 1) orchard-grass (*Dactylis glomerata* L.) represents the more important species as contribution (about 60%) to d.m., protein and crude fibre contents.The quality of forage was improved in the 2nd year of trial because *Trifolium striatum*, L. and *Trifolium phi1iforme*, L. are present.

CONCLUSIONS

The results of the fertilization trial with N and P at "Bella" and "Li Foy" (350 and 1250 m. a.s.l.) during the years, sho the effectiveness of agronomical fertilization interventions depend above all on the presence of nitrogen.In fact in the 1st site, it appears that N fertilization minimizes negative effects of climatic variations (typical of these areas) on botanical composition of fertilized pasture (i.e.: increase of weeds correlated to poor precipitations were reduced by N fertilization). On the contraly a more stable botanical composition assured good yields and quality of forage at "Li Foy" field also because more regular weather conditions were recorded. The evaluation of botanical composition changes as affected by fertilization practices allow appreciation of the yield characteristics evolution and the dynamic of grassland ecosystems that are very important to central areas of Southern Italy for their extent and the low energy and economic costs of production.

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Figure 1

Relative contribution to d.m. production of different species of grassland.

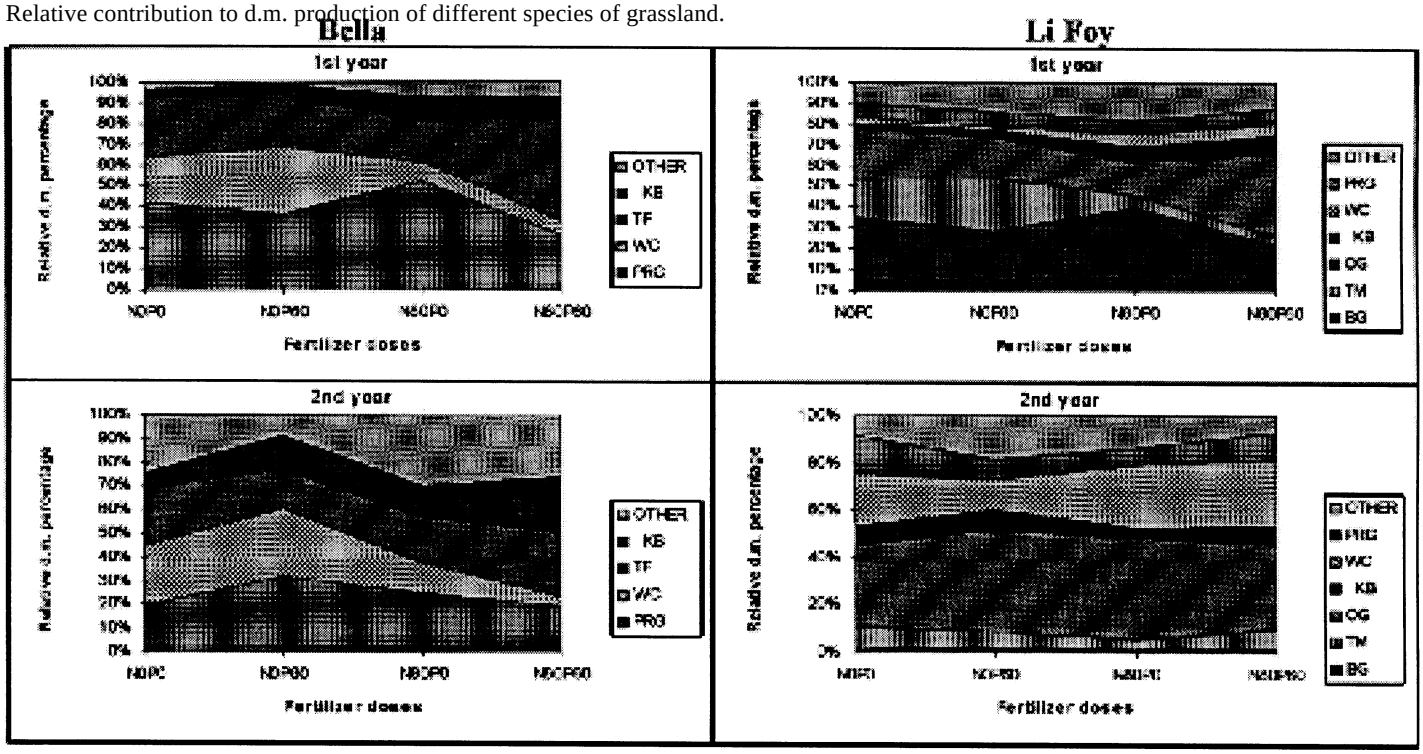

Table 1

Variations of yield and quality of forage as affected by experimental sites and fertilizer treatments.

Treatm.	Bella				Li Foy				Mean			
	d.m. t ha^{-1}	Protein g/100 g	C. Fibre g/100 g	UFL ha^{-1}	d.m. t ha^{-1}	Protein g/100 g	C. Fibre g/100 g	UFL ha^{-1}	d.m. t ha^{-1}	Protein g/100 g	C. Fibre g/100 g	UFL ha^{-1}
N_0P_0	3.90	10.47	30.71	3088	5.35	10.29	33.20	4060	4.68 b	10.57 a	32.30	3577
N_0P_{60}	4.75	9.44	30.85	3560	5.30	10.32	33.15	4000	5.07 ab	9.89 ab	32.72	3756
$N_{80}P_0$	5.68	8.44	32.86	3823	5.27	10.20	33.40	3820	5.47 a	9.22 b	33.35	3854
$N_{80}P_{60}$	5.65	8.12	32.75	3706	5.37	10.04	33.18	4020	5.54 a	9.02 b	33.52	3873

* values followed by different letters are significantly different at P<0.05.