MINERALS IN FORAGES OF SOUTHERN ITALY RELATED TO CLIMATE AND HARVEST TIME EFFECTS.

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ABSTRACT
Three cultivars of Alfalfa (Ascolana, Bresaola L 202 and Canè) in the Apulian "Tavoliere" (southern Italy) environment were studied.

The effects of three water levels (watering of 1000 m^3 ha^{-1} after each cut; 500 m^3 ha^{-1} as above and another water supply with the same volume when the plant reached wilting conditions; with watering of 300 m^3 ha^{-1} every 8 days to assure continuous water availability) and two cutting times (flower bud and 50% of flowering) were investigated.

The cultivars showed a different mineral composition only for quantities not for qualities.

The mineral composition of three cultivars were similarly influenced by irrigation treatments but it changes for effects of cutting times.

Ca, Mg and K contents were higher and Fe content was lower at 50% flowering cutting time than flower bud one.

KEYWORDS
Forage mineral components, cutting time

INTRODUCTION
The alfalfa mineral composition is prominent in many studies which have pinpointed the interest covered of many minerals (Ca, P, K, etc.) from a nutritional viewpoint (Burstrom, 1952; Gorsline *et al*., 1964; Davies, 1975; Simson *et al*., 1979).

The alfalfa mineral quantities depend - strictly - from mineral presence in the soil; the lack or unavailability of mineral in the soil can produce plant mineral deficiency.

Nitrogen requirements of legume forages were, generally, satisfied by N-fixation but not its demands of P, K, Ca, Mg and other essential elements (Gerwig and Gilbert, 1958; Bouchet and Gueguen, 1983).

The variation of alfalfa plant mineral contents is affected by grown leaves, soil nature, fertilization, growth stage and cutting time (Montemurro *et al*., 1966); these last two influence directly the mineral composition and indirectly modify the relationship leaves/steams.

The variations of the mineral elements depend, mostly, from growth stage in which to carry out the cut and, naturally, it depends on environmental factors (Lanza *et al*., 1972).

The aim of this paper was to investigate the effects of cultivar, water levels, climate and cutting time on the mineral composition of alfalfa plants but in this paper only the cultivars and cutting time effects on mineral composition will be presented.

MATERIALS AND METHODS
The research was conducted at Foggia in the Apulian region (southern Italy) on a deep soil classified "Typic chromoxerert" (Soil Taxonomy) and characterized by good agronomic fertility (Rizzo *et al*., 1985).

Three alfalfa cultivars (Ascolana, Bresaola L 202 and Canè) submitted to three water levels (watering of 1000 m^3 ha^{-1} after each cut; 500 m^3 ha^{-1} after each cut + 500 m^3 ha^{-1} when the plants reached wilting conditions; 300 m^3 ha^{-1} every eight days to assure continuous water availability) and two cutting times (flower bud and 50% of flowering) were investigated.

The split-plot design with three replications was used.

Diversified cuts were executed and samples collected from each plot. For all samples the bio-morphologic, chemical and yield parameters were determined. Method of analysis and agronomic results were described in a previous paper (Rizzo *et al.*, 1985).

Samples of plants from each plot were also analyzed for mineral composition. Mineral components were determined by atomic absorption spectroscopy following Pinta (1973) method, that allow extraction of all plant mineral components.

Standard analysis of variance test were performed and means compared using "Student-Newman-Keul test".

RESULTS AND DISCUSSION
Cultivars, water levels and cutting times were the main effects considered, and only the significant interaction among the factors in the study were reported.

The mean values show a good level of almost all the minerals considered, except for low Fe (82.90 ppm) and poor Mn content (48.78 ppm).

Ascolana cultivar (table 1) presents higher Ca, Na, K, Zn and Mn and lower Fe contents than the other two cultivars. Bresaola L 202 cultivar set oneself between higher Na and Zn contents of Ascolana and lower of Canè.

These differences, in our trial, present differences that are rather low (also if significant), as regards the value of the literature. The absorption of cations is thus more or less a non specific process but depends on the antagonistic effect among cations. The uptake rate of Ca^{++} is usually lower than of K^+; this low Ca^{++} uptake can be competitively depressed by the presence of other cations such as K^+ and NH_4^+ which are rapidly taken up by plant roots (Candussio, 1960; Clairon et al., 1969; Blanchet et al., 1962; Mengel et al., 1982). Cultivars gave no significant effect on Mg content.

Mineral component variations of alfalfa, consequently, influence mineral components ratio. The Ca:Mg ratio was higher for Canè that was followed by Ascolana and Bresaola L 202. K:Ca ratio was not significant for Ascolana and Bresaola L 202 but it was different and lower for Canè.

The influence of cutting time on mineral composition was reported in table 1. There are significant effects of cutting time on Ca, Mg, K and Fe contents but no significant effects regarding the other mineral investigated. Ca, Mg and K contents increase during plant growth; in fact, there was a higher content of the above-mentioned mineral at 50% of flowering. Fe content, instead, decreased during plant growth, a lower content in Fe than there was at flower bud.

Significant effects of cutting times of 50% of flowering on Ca, Mg and K contents of three alfalfa cultivars were reported in figure 1. "Ascolana x 50% of flowering" interaction was higher than the other cultivars.

Significant effects of "Cv x flower bud" interaction on Fe level in alfalfa and its content decrease during the growth of plants.

CONCLUSIONS
Between the trial factors, certainly the cultivars show best influence on alfalfa mineral composition with higher contents of Ca, Na, K and Mn in the Ascolana cultivar, Cu in the Canè cultivar, Fe in the Bresaola and Canè cultivars, while Mg contents of the three cultivars were undifferentiated.

The cutting time influenced the Ca, Mg and K only (better at 50% of flowering) and the Fe content (better at flower bud).

The conclusions, that are possible to be made on the basis of the results now obtained, could be summarized as follows: the mineral global

nutrition was good, the level of Ca, Mg and Cu were adequate, the K, Na and Zn contents were elevated while the Fe and Mn content were low.

In our environmental conditions it is preferable to cut at 50% of flowering because the quantity of mineral in that cutting time was close to the proper one for the animal nutrition.

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Table 1
Effects of cultivars and cutting- time on alfalfa mineral composition.

	Ca	Na	Mg	K	Fe	Zn	Cu	Mn
	% d.m.				ppm			
Cultivars								
Ascolana	0.92 a	0.053 a	0.35 a	3.09 a	74.7 b	32.1 a	7.38 b	51.8 a
Bresaola L202	0.76 c	0.046 b	0.33 a	2.54 b	86.4 a	29.6 ab	7.67 b	46.1 c
Canè	0.83 b	0.044 c	0.31 a	2.69 b	87.6 a	27.7 b	8.35 a	48.4 b
Cutting time								
Flower bud	0.80 b	0.048 a	0.32 b	2.76 b	84.3 a	29.1 a	7.78 a	48.1 a
50% flowering	0.91 a	0.048 a	0.34 a	2.80 a	81.5 b	30.4 a	7.82 a	49.4 a

Column means followed with different letters are significantly different at P<0.05.

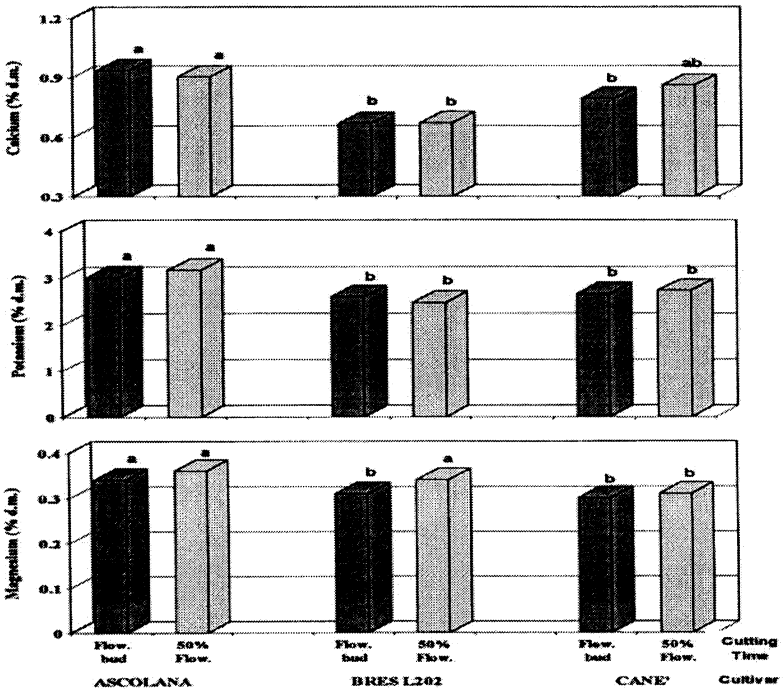

Figure 1
Effects of "Cultivars x cutting time" intercation on alfalfa mineral composition.