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***Chrysanthemum coronarium* L.:** **A new pasture species for** **Mediterranean forage systems**

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SUMMARY - Some spontaneous species growing as weeds in the cultivated area of Mediterranean basin countries can be considered a valuable source of feed with high palatability for dairy sheep. *Chrysanthemum coronarium* L. is a herbaceous annual weed of winter cereals also grazed by sheep. To evaluate its re-introduction and role, as pasture species, the forage production, nutritive value and self-reseeding capacity of a sowed sward of *C. coronarium*, a trial was carried out with interdisciplinary approach in Sardinia (Italy) during 1993-95. *C. coronarium* appears very interesting as a forage species and its introduction in forage chains is desirable.

Key words: *Chrysanthemum coronarium* L., forage yield, phytomass partitioning, chemical composition, feeding value.

RESUME - "*Chrysanthemum coronarium* L. : une nouvelle espèce fourragère pour les systèmes pastoraux méditerranéens". Nombreuses espèces végétales spontanées, réputées des adventices, représentent un problème, particulièrement dans les zones cultivées du bassin Méditerranéen; cependant quelques unes peuvent être considérées une importante source d'aliment appétible pour les brebis laitières. Le *Chrysanthemum coronarium* L. est une herbacée annuelle, adventice des céréales d'hiver et pâturée par les ovins. Entre 1993 et 1995, en Sardaigne (Italie), avec un travail interdisciplinaire, sa réintroduction et son rôle, comme fourragère à pâturer, a été évaluée, ainsi que sa production fourragère et sa valeur nutritive. La capacité de réensemencer d'une surface labourée et semée avec *C. coronarium* a été étudiée. Le *C. coronarium* semble une espèce fourragère très intéressante et sa introduction dans les chaînes d'affouragement est à proposer.

Mots-clés : *Chrysanthemum coronarium* L., rendement fourrager, répartition phytomasse, composition chimique, valeur nutritive.

Introduction

Many spontaneous species growing as weeds represent a problem particularly in the cultivated area of Mediterranean basin countries, but some of them are usually grazed by animals. The introduction as crop of some weeds can improve the forage resources and feed supply for livestock (Robledo *et al.*, 1989). *Chrysanthemum coronarium* L. is a member of *Compositae* family mainly known as a weed in cereals. It is a herbaceous annual plant with aromatic flavour, stems up to 100 cm, branched, oblong leaves mostly 2-pinnatisect and yellow florets (Pignatti, 1982). An accidental introduction and diffusion of *C. coronarium* on a pasture based on a mixture of annual ryegrass and subterranean clover occurred within a large experiment. It was observed that *C. coronarium* establishes rapidly, can be grazed early in the growing season and persists where other pasture species may disappear; for these reasons it can be considered a valuable source of feed. On the basis of these preliminary observations the main aim of this interdisciplinary research was the productive and qualitative characterization of a *C. coronarium* pure sowed sward in order to evaluate the possibility of its introduction and role, as pasture species, within rainfed forage systems for dairy ewe.

Materials and methods

The trial was carried out during 1993-95 in North Sardinia (Italy), at the experimental farm of Istituto Zootecnico e Caseario per la Sardegna (IZCS), on flat clay calcareous soil, pH 7.5 with low N and P₂O₅ contents and adequate K₂O content.

In summer 1993, an adequate amount of seed (i.e. achens) was collected from a local population of *C. coronarium*, using a small portable vacuum harvester. Plots (5 m² each) were established in November at a seed rate of 30 kg ha⁻¹ of viable seed; fertilization was applied with 100 Kg ha⁻¹ year⁻¹ of N and P₂O₅. Undisturbed plots were cut once every two weeks, during the growing season, and the following data were collected: seedling establishment (no. m²); dry matter (DM) yield, and its partitioning in stems, leaves and racemes on plot subsample; crude protein (CP), neutral detergent fiber (NDF) of forage subsamples were determined; plant flowering time, seed yield, hard seed percentage and seedling re-establishment from uncut plots.

Moreover a grazing trial was carried out in spring 1995 (April) to assess the feeding value (intake and digestibility) of *C. coronarium* as compared to (*Lolium rigidum* Gaud. "Nurra", an annual self-reseeding grass successfully used to improve the natural pasture under rainfed conditions. Two plots of 5,000 m², sown in October 1994 respectively with *L. rigidum* and *C. coronarium* and grazed twice during winter by spare ewes, were used. Fourteen mature lactating ewes (about 130 days post-lambing) were blocked in two groups according to their body weight, body condition and milk yield and these groups were randomly allotted to the experimental plots. The plots were grazed from 15 to 30 April for 24 hours day⁻¹. Sward height and herbage availability were by far above the levels that are regarded as limiting sheep intake throughout the trial (Penning, 1986). Hand-plucked samples were collected on two occasions during the intake measurement period (24-28 April) in order to estimate the quality of animal diets. All samples were oven-dried at 60°C and submitted for chemical analysis and *in vitro* DM digestibility (Aufrere and Demarquilly, 1989).

Voluntary intake was measured on all the experimental ewes (N=14) by the n-alkane method (Mayes *et al.*, 1986). The intake of digestible DM was estimated by multiplying the DM intake by the average *in vitro* DM digestibility of each species.

Results and discussion

The total annual rainfall from September 1993 to August 1994 was 543 mm, mainly concentrated in autumn rather than in spring. Seedling establishment and development were regular; more than 1,300 seedlings m⁻² of *C. coronarium* were recorded one month after sowing. The first cutting was made in January, 84 days after sowing. Total forage yield for each date of cutting is reported in Fig. 1. DM progressively increased from January to the first ten days of May (six months after seedling emergence), reaching 8.8 t ha⁻¹; a reduction was observed later, probably due to assimilates translocation toward reproductive organs and tissue senescence. Phytomass partitioning evidenced a progressive reduction of leaf contribution, below 35% of the total DM, from the vegetative phase to the beginning of flowering, while stems increased. Head contribution represented 40% of the total phytomass. The yield obtained resulted comparable or higher to those of other common forage crops in the area but the contribution of reproductive organs to the total DM can be considered more relevant. Crude protein content (Fig. 2) of leaves was from twice to three times higher than stems, while that of heads was lower. NDF content was similar for all phytomass components until the end of winter. In spring it increased in stems and, to a lesser extent, in heads, but not in leaves. According to these data, a satisfactory forage quality is expected also in late spring. Flowering started in March, about 150 days after the emergence, and lasted for 8 weeks; the heads were completely ripened in middle June. On average 50 heads and more than 10,000 seeds per plant were recorded in uncut plots; hard seeds at harvest were about 90% and in the following autumn about 900 seedlings m⁻² were recorded. These first data have evidenced a high self-reseeding capacity of *C. coronarium*.

Hand-plucked sample chemical composition (Table 1) showed a trend towards lower DM and NDF of *C. coronarium* compared to *L. rigidum*. This can probably explain the higher *in vitro* DM digestibility of the former species. Intake did not differ significantly between species even if a light higher consumption of *L. rigidum* is noticeable. The reverse trend was evidenced by the intake of digestible DM. No effect of the forage species on milk yield, change of body weight or body condition score (not shown) was found. Nevertheless data on a long-term grazing trial carried out at IZCS did point out a high milk production from a *C. coronarium* based pasture grazed with medium-high stocking rate by ewes non-supplemented during lactation (N. Fois, pers. comm.). As a matter of fact longer-term grazing trials, including intake and digestibility measures, are probably necessary to further understand the response of dairy sheep to the grazing of this forage species.

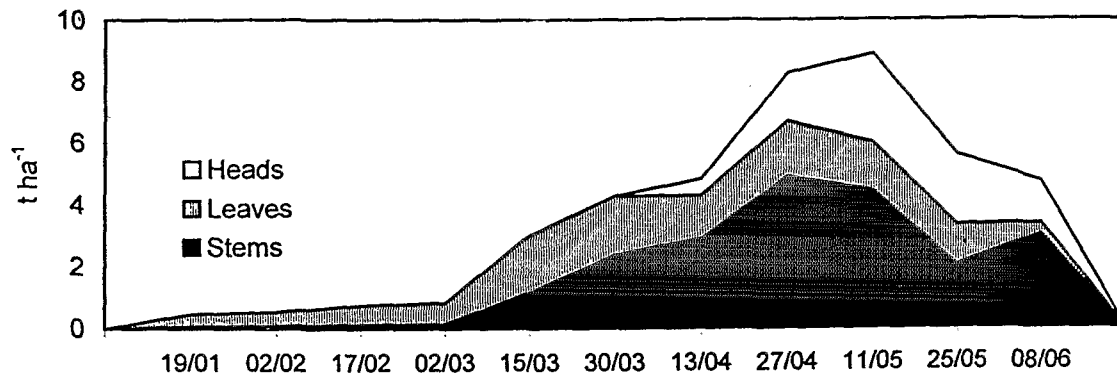


Fig. 1. Trend of dry matter production and its partitioning in stems, leaves and heads from January to June 1994.

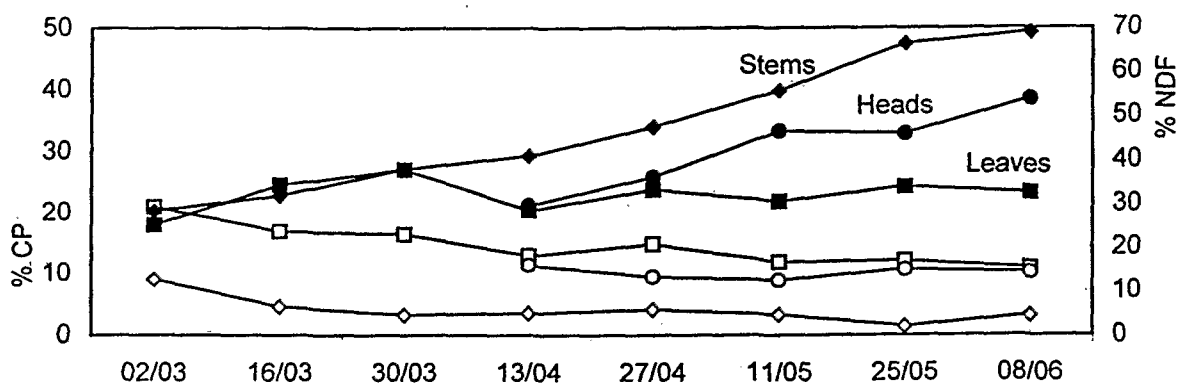


Fig. 2. Crude protein (empty markers) and NDF (bold markers) contents (% of DM) of phytomass components.

Conclusion

On the basis of the agronomic results so far obtained, *C. coronarium* appears very interesting as a forage species and its introduction in forage chains is desirable.

From a strictly nutritional view point, *C. coronarium* shows a very high level of digestible cell content, a nitrogen level ranging from high (leafy stage) to moderate (flowering stage) and, as a consequence, a high digestibility throughout the grazing season.

In particular, due to the high nutritive value and the palatability of the flowers (D'Urso *et al.*, 1993), dairy sheep can face with lower availability of leaves and the decreased nutritive value of stems during spring, with satisfactory intake and performance up to mid-spring. For this reason it can be regarded as interesting alternative to the legumes in order to successfully complement diets based on annual grasses.

Table 1. Hand-plucked sample chemical composition (no.= 2 per species) and intake of DM and digestible DM in lactating Sarda ewes (no.= 7 per species) grazing *L. rigidum* and *C. coronarium* in reproductive stage. Means \pm standard deviations

Item	<i>Chrysanthemum coronarium</i>	<i>Lolium rigidum</i>
Hand-plucked sample composition		
Dry matter (%)	18.6 \pm 1.2	27.8 \pm 1.1
Organic matter (% DM)	92.2 \pm 0.1	93.4 \pm 0.9
Crude protein (% DM)	12.3 \pm 0.5	12.9 \pm 0.6
NDF (% DM)	22.9 \pm 2.1	56.1 \pm 1.4
In vitro DM digestibility (%)	85.7 \pm 0.2	62.8 [†]
Intake (g ewe ⁻¹ day ⁻¹)		
Dry matter	1374 \pm 530	1564 \pm 440
Digestible dry matter	1178 \pm 454	982 \pm 276

[†]One sample was missed.

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