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Nutrient composition of native vegetation growing in the pastures of central Tunisia

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SUMMARY – A preliminary research was carried out to evaluate, by chemical composition, dry matter digestibility and mineral concentrations, the nutritive value of native vegetation growing in the pastures of central Tunisia. The study examined 12 species (*Artemisia herba-alba* Asso., *Chrozophora tinctoria* (L.) A.H.L. Juss, *Solanum vigum*, *Globularia alypum* L., *Brassica souliei* (Batt.), *Colestephus myconis* L., *Thymus hirtus* ssp. *algeriensis* Willd., *Marrubium vulgare* L.; *Pinus halepensis* Mill., *Plantago lagopus* L., *Rosmarinus officinalis* L. and *Pistacia lentiscus* L.) collected in the spring (April and May). Crude protein content ranged from 4.74 (*Artemisia herba alba* Asso.) to 24.66% dry matter (*Brassica souliei* Batt.). Most of the species had digestibility values above 50%, which is considered adequate for high animal performance on pastures. Mineral concentration showed that levels of Ca were high and over the standard requirements for small ruminant production. Magnesium, zinc, copper and manganese levels could meet the requirements of small ruminants, but phosphorus and iron levels were slightly deficient for some of the species.

Key words: Crude protein, dry matter digestibility, pasture, small ruminant, mineral composition.

RESUME – *"Composition en nutriments de la végétation naturelle des parcours du centre de la Tunisie". Une étude préliminaire a été réalisée dont l'objectif est d'évaluer la valeur nutritive de la végétation naturelle rencontrée dans les parcours du centre de la Tunisie. Douze espèces (*Artemisia herba alba *Asso.,* Chrozophora tinctoria*,* Solanum vigum*,* Globularia alypum *L.,* Brassica souliei *(Batt.),* Colestephus myconis *L.,* Thymus hirtus ssp. *algeriensis,* Marrubium vulgare *L.,* Pinus halepensis*,* Plantago lagopus *L.,* Rosmarinus officinalis *L. et* Pistacia lentiscus *L.) ont été collectées au printemps (avril et mai) et analysées. Les teneurs en protéines brutes ont varié de 4,74 (*Artemisia herba alba *Asso.) à 24,66% (*Brassica souliei *Batt.). La majorité des espèces étudiées avaient une digestibilité supérieure à 50%. Les teneurs en calcium ont été supérieures aux besoins de production des petits ruminants. Les concentrations en Mg, Zn, Cu et Mn pourraient couvrir les besoins des petits ruminants tandis que le phosphore et le fer sont légèrement déficitaires dans quelques espèces.*

Mots-clés : *Protéines brutes, parcours, petit ruminant, composition minérale.*

Introduction

In arid and semi-arid regions of Tunisia, the nutrition of sheep and goat managed under extensive production systems is based on the pasture yield most of the year. However, there is a lack of information regarding the nutritive value of vegetation growing naturally in these areas. This paper presents nutritional information of forages commonly observed being consumed by sheep and goats grazing in the pastures of central Tunisia.

Materials and methods

Forage samples were collected from a natural pasture in Central Tunisia. The site is located in the semi-arid zone. The annual rainfall is 100-200 mm in the rainy season beginning December and lasting until mid-April.

Plants consumed by small ruminants such as *Artemisia herba alba* Asso, *Chrozophora tinctoria*, *Solanum vigum*, *Globularia alypum* L., *Brassica souliei* (Batt.), *Colestephus myconis* L., *Thymus hirtus* sudsp *algeriensis*, *Marrubium vulgare* L.; *Pinus halepensis*, *Plantago lagopus* L., *Rosmarinus officinalis* L.and *Pistacia lentiscus* L. were collected in spring (April and May) at different locations in the central of Tunisia. Consumed parts for each species (leaves and twigs for woody species and

whole plant for annual plants) were randomly sampled taking at least 10 plants of each specie, pooled into one sample, dried at 40℃ and milled at 1 mm.

Ground samples were analysed for dry matter (DM), organic matter (OM) and crude protein (CP) according to the procedure described by the AOAC (1990). Fibre fractions, namely, neutral detergent fibre (NDF) and acid detergent fibre (ADF) of the samples were analysed according to the method described by Goering and Van Soest (1970). Dry matter digestibility (DMD) was calculated using the Van Soest (1967) summative equation as follows: *DMD= 0.98CC + NDF (1.473 – 0.789 log ADF) – 12.9*; where CC is cell contents, NDF the neutral detergent fibre and ADF the acid detergent fibre. The samples were analysed for the mineral elements according to procedures described by Faithfull (1974). Calcium, P, Mg, Mn and Fe were read using atomic absorption spectrophotometer while K and Na were determined by emission.

Results

Chemical composition

The chemical composition values for the studied species are presented in Table 1. Mean organic matter content varied from 79.2% for *Brassica souliei (Batt.)* to 92.73% for *Chrozophora tinctoria*. Crude protein content is fairly high in four species being between 15.45% in *Colestephus myconis L.* and 24.66% in *Brassica souliei* (Batt.), both are usually higher than those found in several Mediterranean grasses. Earlier studies on a wide variety of naturally growing native vegetation in East Africa (Dougall and Bogdan, 1966; Gihad, 1976) indicated crude protein content in the range of 9.5±35.9%. Data on the fibre fraction showed that the NDF and ADF content of the samples varied greatly among species (Table 1) and were lowest in *Brassica souliei* (Batt.) and highest in *Thymus hirtus* s.

Table1. Nutrient composition of native plants of pastures of central Tunisia

	%					
	MS	MO	CP	NDF	ADF	DMD [a]
Artemisia herba alba Asso.	-	92.36	4.74	56.11	48.65	38.10
Chrozophora tinctoria	50.00	92.73	9.13	45.29	31.06	54.10
Solanum vigum	20.00	84.84	15.63	43.53	24.71	58.71
Globularia alypum	66.67	-	7.15	47.47	31.80	52.23
Brassica souliei	15.38	79.20	24.66	29.17	15.10	72.34
Colestephus myconis	12.50	84.68	15.45	44.57	19.74	61.52
Thymus hirtus s.	50.00	89.71	5.88	68.38	50.50	26.91
Marrubium vulgare	26.92	83.58	18.88	39.93	24.17	61.20
Pinus halepensis	46.15	94.88	7.06	53.03	38.36	44.96
Plantago lagopus	11.11	84.55	13.68	50.49	27.91	52.40
Rosmarinus officinalis	50.00	92.25	8.36	45.87	34.52	52.04
Pistacia lentiscus	53.85	93.11	7.88	45.3	27.2	56.15

[a]DMD calculated using Van Soest (1967) summative equation as follows:
DMD = 0.98 cell contents + NDF (1.473 - 0.789 log ADF) - 12.9.

Mineral concentrations

Table 2 shows the mineral contents of the evaluated species. Calcium was as high as 4.99% in *Solanum vigum* while the P content varied from 0.09% in *Thymus hirtus s.* to 0.98% in *Pistacia lentiscus* L. Mean calcium to phosphorus ratios vary between 4.54:1 for *Pistacia lentiscus* L. and 24.4:1 for *Thymus hirtus* s.. Relative to animal requirements for production (McDowell, 1997), all species appeared quite suitable for animal nutrition in terms of contents of Ca, P, K, Mg, and Na, although rather low in Mn for production. They appear deficient in Fe compared to animal

requirements from the feeding standards (McDowell (1997). The studied species were particularly high in Ca relative to native grasses and others conventional fodder plants (Minson, 1990).

Table 2. Mineral levels in native plants of pastures of central Tunisia

	%DM			ppm						Ca:P
	P	K	Na	Ca	Mg	Fe	Cu	Mn	Zn	
Artemisia herba alba	0.12	1.57	0.25	1.86	0.28	0.015	15.3	8.90	75.70	15.05
Chrozophora tinctoria	0.15	0.99	0.11	1.38	0.32	0.010	4.40	8.30	49.30	9.38
Solanum vigum	0.25	1.00	0.90	4.99	1.34	0.014	4.20	6.70	23.00	20.10
Globularia alypum	0.12	0.77	0.04	2.84	0.25	0.013	6.20	4.80	7.40	23.89
Brassica souliei	0.39	4.30	0.18	3.86	1.03	0.014	4.10	6.80	57.40	9.96
Colestephus myconis	0.37	4.44	0.64	1.83	0.56	0.011	8.60	10.3	29.50	4.99
Thymus hirtus	0.09	1.11	0.03	2.18	0.33	0.040	2.90	5.00	47.10	24.42
Marrubium vulgare	0.30	5.31	0.03	2.11	0.35	0.007	3.50	2.50	10.40	7.02
Pinus halepensis	0.14	0.60	0.03	1.68	0.37	0.007	2.90	2.60	21.20	11.61
Plantago lagopus	0.18	2.38	0.18	3.20	0.87	0.009	3.90	13.3	34.30	17.92
Rosmarinus officinalis	0.12	1.32	0.03	2.76	0.45	0.010	4.30	6.30	16.60	23.28
Pistacia lentiscus	0.98	0.48	0.02	4.44	0.63	0.005	2.80	1.70	28.40	4.54

The Ca:P ratio in feeds is an important consideration for animal nutrition with tolerable limits being in the range of 1 : 1 and 7 : 1 for ruminants. Wide ratios found in this study are attributable to high Ca forage content. Relative to the suggested range of 0.19±0.77 Ca requirements in diets of ruminants grazing native pastures (McDowell, 1997), the forages recorded more than 10 times the levels of Ca. Although the levels of P in forages had been found below the required range, Ca gross is likely to aggravate aphosphorosis in unsupplemented animals.

Digestibility

The values of estimated DMD ranged 26.91-72.34%, with the lowest for *Thymus hirtus s.* (26.91%), *Artemisia herba alba* Asso. (38.10%) and *Pinus halepensis* (44.96%). Most of the species have digestibility values above 50% which is considered adequate for high animal performance on pastures (McDowell, 1972). Overall, *Brassica souliei* (Batt.), *Colestephus myconis* L. and *Marrubium vulgare* L. had the highest DMD compared with the other species. These findings were consistent with their chemical composition as shown in Table 1 of which *Brassica souliei (Batt.)*, *Colestephus myconis* L. and *Marrubium vulgare* L. had higher CP but generally lower cell wall constituents (Table 1). Forages seem to be promising in terms of their energy content for supporting production.

Conclusions

Nutritive value of natural vegetation growing in the pastures of central Tunisia appears quite promising in energy (up to 50% DMD) and some mineral elements for animal feeding. Among the studied species, *Brassica souliei , Colestephus myconis* and *Marrubium vulgare* had higher nutritive value.

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