Nutritive value of cactus pear for cattle in south of Morocco

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Introduction

Cactus pear is a fodder species which is adequate for the arid and semi-arid regions due to its resistance to drought

Many countries (Mexico, USA, Chilly, Peru, South Africa, Tunisia, etc.) produce important quantities of cactus pear for cattle

And some species and cultivars are selected in certain country (Mexico) as feed stock for cattle in case of scarcity

Cactus pear is consumed by cattle because Its pads are rich in water, fibbers, proteins and nutritive elements (phosphorus, sodium, potassium and calcium).

Cactus pear is grazed by animals on the field in the countries where exist ranches of cactus (Texas, Mexico) or collected for domestic cattle like as it’s done in Morocco.

Collected pads are often coming from the cut of broken and damaged branches, and the cut of lower ramifications

Pads are given alone to animals or in mixture with other fodder elements like as grasses, straw or maize stems

The aim of this work was to determine the nutritive value of cactus pear for cattle in Morocco and to constitute a database for the conception of food intakes with cactus

Materials and Methods

The study was carried out on ‘’Aissa’’ (‘A’) and ‘’Moussa’’ (‘M’) of *Opuntia ficus indica* (L.) Mill. in two regions in south of Morocco : Sidi Ifni (SI) where they are wild and Agadir (Ag) where they are domesticated

Comparison between cultivars is done in the locality of Ag. A sample of 20 pads (one year old) is collected/cultivar and/locality for chemical analyses in the laboratory

They are collected in January on healthy and adult plantations in 2 localities in ‘’Sboya’’ (locality Zlaguim (Z) and locality Ahl Haymmad (AH)) in SI area (altitude: 250m; latitude: 29°15’ north; longitude: 10°12’ west)

and in the experimental station of the ‘’Institut Agronomique et Vétérinaire Hassan II” in Ag area (altitude: 32m; latitude: 30°22’ north; lonitude.: 9°39’ west)

In SI area, ‘M’ is collected in the locality Z, and ‘A’ in the locality AH, and in Ag area both cultivars are collected in the same locality.

Before analysis, pads are dried in a drying room at 75-80°C for 48 to 72 hours. They are crushed with a crusher and then dried another time at 55-65°C for 4 hours

Analyses are related to the contents of pads in mineral elements; they are repeated 4 times by cultivar and by locality

Nitrogen analysis is done by the Kjeldahl method and the content of total nitrogen in pads is determined according to Bradstreet (1965).

Phosphorus analysis is done in a colorimeter and its content in pads is determined according to Chapman and Pratt (1961)

Other elements (Ca, Na, Mg and K) analysis is done with a spectrophotometer and their contents in pads are determined according to Chapman and Pratt (1961)

Soils of localities where pads are taken are analysed in laboratory

Nitric nitrogen is determined according to Keeney and Nelson (1982)

Assimilated phosphorus is determined according to Olsen and Sommers (1982)

and K, Ca, Na and Mg are determined according to Grant (1982)

Results and Discussion

Contents of ‘A’ and ‘M’ in mineral elements in both areas are presented in table 1.

Table 1: Contents of pads of Opuntia ficus indica (L.) Mill cv ‘’Aissa” and ‘’Moussa” in mineral elements in Zlaguim (Z) and Ahl Haimmad (AH) localities in Sidi Ifni (SI) area and in the experimental station of IAV Hassan II (IAV Hassan II) in Agadir (Ag)

Mineral elements	cv ‘Moussa’		cv ‘Aissa’	
	Locality Z in SI	Locality CHA in AG	Locality AH in SI	Locality CHA in AG
N (%)	1,50±0,08	1,03±0,12	1,33±0,10	0,86±0,04
CP (%) (%N x 6,25)	9,37	6,43	8,31	5,37
P (%)	—0,20±0,02—	0,092±0,00	0,090±0,00	0,084±0,01
Ca (%)	5,12±0,35	4,78±0,33	3,99±0,79	4,26±0,54
Na (ppm)	11±0,10	11±0,20	12±0,30	15±0,30
Mg (%)	0,24±0,05	0,30±0,08	0,22±0,04	0,22±0,03
K (%)	0,65±0,03	0,52±0,08	0,45±0,10	0,56±0,05

Content of N (%) in SI is higher than that in Ag

	cv Moussa	cv Aissa
SI	**1.50**	**1.33**
Ag	**1.30**	**0.86**

That is due to higher level of nitrates (%) in the localities of SI than that of Ag

Localities of SI	**Z**	**29.50**
	AH	**28.00**
Locality IAV Hassan II in Ag	**25.50-26.50**	

Contents of soils in mineral elements in the localities where ‘A’ and ‘M’ are taken are presented in table 2

Table 2: Composition of soil in mineral elements in Zlaguim (Z) and Ahl Haymmad (AH) localities in SI and IAV Hassan II in Ag.

Mineral elements	cv 'Moussa'		cv 'Aissa'	
	Locality Z in SI	IAV Hassan II in Ag	Locality AH in SI	IAV Hassan II in Ag
Nitrates (%)	29,50±7,35	26,50±1,91	28,00±7,26	25,50±4,20
P (ppm)	0,06±0,02	0,02±0,00	0,02±0,01	0,02±0,00
Active limestone (%)	7,75±1,32	11,00±0,24	5,45±0,83	11,13±0,62
Ca (ppm)	1,26±0,05	1,29±0,04	1,31±0,06	1,30±0,05
Na (ppm)	0,08±0,03	0,11±0,01	0,12±0,04	0,12±0,01
Mg (ppm)	0,73±0,04	0,75±0,07	0,67±0,07	0,76±0,07
K (ppm)	0,23±0,04	0,18±0,06	0,24±0,06	0,19±0,05

Conversation of N to crude proteins (CP) (Gonzalez, 1989) (table 1) showed that ‘M’ met the CP requirement of dairy cows (9,2%) (N.R.C., 1976) in SI (9,37%) and those of dry cows (5,9%) in Ag (6,43%).

‘A’ met the CP requirement of dry cows in SI (8,31%) and both cultivars met those of sheep (0,21- 0,99%) (N.R.C., 1985) and goats (0,05-0,46%) (N.R.C., 1981) in both areas (5,37-9,37%).

Average content of CP in pads of *Opuntia ficus indica* in Tunisia is 3,84% (Nefzaoui and Ben Salem, 2000) and that of *Opuntia lindheimeri* in Texas is 5,50% (Gonzalez, 1989).

Whereas Gregory and Felker (1992) reported that some clones in Brazil have more than 11% of CP.

Nefzaoui and Ben Salem (2000) and Gonzalez (1989) reported that a low content in CP could be improved by an application of fertilisation or by an add and/or a combination with another source of fodder

P level (%) in both cultivars is also higher in SI than in Ag

	cv Moussa	cv Aissa
SI	**0.20**	**0.090**
Ag	**0.092**	**0.084**

That is due to high level of P in soil of Z in SI

Average P level in pads of *Opuntia ficus indica* in Tunisia is 0,04% (Nefzaoui and Ben Salem, 2000) and that of *Opuntia lindheimeri* in Texas is 0,08% (Gonzalez, 1989)

According to N.R.C., ‘M’ has P level adequate for dry cows (0,18%) in SI (0,20%) and not adequate for them in Ag (0,092%),

and ‘A’ has P level which is not adequate for dry cows in both areas (0,090% in IS and 0,084 in Ag)

However, both cultivars have P level which is recommended for sheep (0,004-0,020%) and goats (0,002-0,013%) in both areas (0,084-0,20%).

Gonzalez (1989) reported that an application of P fertilization can improve P level in pads.

According to the Laboratory of soil analysis, soils where ‘M’ and ‘A’ are taken are rich in Mg and in Ca (they exceed 7%).

Thus, both cultivars exceed Ca and Mg requirements of cattle in both areas: those of beef are 0,18-0,44% Ca and 0,04-0,18 Mg

Nefzaoui and Ben Salem (2000) reported that average level of Ca in *Opuntia ficus indica* in Tunisia is 8,66% and Gonzalez (1987) indicated that that of Ca in *Opuntia lindeheimeri* in Texas is 3,0%

For Na, both cultivars in both areas (11-15ppm) did not meet Na requirements of beef (0,06%),

but deficiency in Na could be corrected by Na of drinking water of cattle or by adding salt blocks in front of the animals to lick it (Gonzalez, 1989), like as it's done by most of cattle breeders in Morocco.

For K, 'M' (0,65%) met the requirement of beef (0,6-0,8%) in SI (0,65%)

Comparison of the 2 cultivars in the locality IAV Hassan II in Ag showed that for N, P, Ca and Mg, ‘M’ is higher than ‘A’

	N (%)	P (%)	Ca (%)	Mg (%)
cv Moussa	**1.03**	**0.092**	**4.78**	**0.30**
cv Aissa	**0.86**	**0.084**	**4.26**	**0.22**

Soil analysis showed that except for nitrates, for which soil where ‘M’ is taken is higher than that of ‘A’, P, Ca and Mg levels in soil where ‘A’ is taken are similar or higher than that of ‘M’

	Nitrates (%)	P (ppm)	Ca (ppm)	Mg (ppm)
Soil where Moussa is taken	**26.50**	**0.02**	**1.29**	**0.75**
Soil where Aissa is taken	**25.50**	**0.02**	**1.30**	**0.76**

What shows that ‘M’ content in these elements is higher than that of ‘A’

Na and K levels in ‘A’ are higher than those in ‘M’

	Na (ppm)	K (%)
cv Moussa	**11**	**0.52**
cv Aissa	**15**	**0.56**

and soil analysis showed that level of Na and K in soil where ‘A’ is taken is higher than that where ‘M’ is taken

	Na (ppm)	K (ppm)
cv Moussa	**0.11**	**0.18**
cv Aissa	**0.12**	**0.19**

What explains a higher level of K and Na in ‘A’ than in ‘M’

Conclusion

Chemical analyses are important in the determination of nutritive value of cactus pear for cattle

‘A’ and ‘M’ have higher N in SI than in Ag because soil in SI has higher nitrates than in Ag.

‘M’ met CP requirement of dairy cows in SI and those of dry cows in Ag, and ‘A’ met those of dry cows in SI. However, both cultivars met CP levels of sheep and goats in both areas

‘A’ and ‘M’ have also higher P in SI than in Ag. ‘M’ has P adequate for dry cows in SI and both cultivars don’t have it these cows in Ag. However, both cultivars have P adequate for sheep and goats in both areas

Ca and Mg levels in both cultivars is high in both areas and exceeds Ca and Mg requirements for cattle in these elements

both cultivars did not meet Na level recommended for cattle in both areas

Comparison between these cultivars in the locality of Ag showed that P, Ca and Mg levels are higher in ‘Moussa’ than in ‘Aissa’

Thank you for your attention