

Main plant species grazed by goats in two types of rangelands in Algeria: mountainous vs. Saharan

S.A. Kadi¹, F. Gani², A. Mouhous¹, H. Guermah³, R. Fiouane¹, F. Djellal⁴

¹Université Mouloud MAMMERI. Département des Sciences agronomiques, Faculté des sciences biologiques et sciences agronomiques, 15000, Tizi-Ouzou, Algeria

²Université Ibn Khaldoun. Faculté SNV, Département d'agronomie, 14000, Tiaret, Algeria

³Université Mohammed Boudiaf. Département d'agronomie, Faculté des Sciences, 28000, M'sila, Algeria

⁴Université Ferhat ABBAS-Sétif1. FSNV, Département d'agronomie, 19000, Sétif, Algeria

Abstract. The objective of this study is to compare the pasture use and to evaluate the diversity of plant species grazed by goats in two different ecosystems: mountainous vs. Saharan range. For this, a questionnaire survey was conducted among 100 farmers in Tizi-Ouzou (mountainous region) and another 100 in Bechar (Saharan region) during the same period (15 March-17 May). In Tizi-Ouzou, the goat's diet is almost (98%) based on grazing + supplement to the trough while in Bechar this practice is noted in 85% of the farms. In Tizi-Ouzou, this grazing takes place largely on the forest rangelands, maquis, natural meadows and fallows while in Bechar the goats graze especially in the ergs, regs and beds of Wadis. The main grazed plant species in the Tizi-Ouzou region are: *Rosa sempervirens*, *Phillyrea angustifolia*, *Myrtus communis*, *Asphodelus microcarpus*, *Sinapis arvensis*, *Hedysarum flexuosum*, *Pistacia lentiscus*, *Calycotum spinosa* or *Cytisus spinosus*, *Rubus fruticosus*, *Inula viscosa* or *Dittrichia viscosa*, *Erica arborea* and *Lavandula stoechas*. In Bechar, on the other hand, goats graze mainly: *Cotula cinerea*, *Panicum turgidum*, *Stipagrostis pungens*, *Diplotaxis harra*, *Euphorbia guyoniana*, *Atriplex halimus*, *Tamarix gallica*, *Suaeda mollis*, *Artemisia herba alba*, *Zizyphus lotus*, *Helianthemum lippii*, *Retama retam*, *Moltkiopsis ciliata*, *Erodium triangulare*. Pasture is almost the goat's diet in both regions. It should be noted the rich biodiversity of grazing species in the Saharan range which is at the same level or even better than the mountainous region in this study.

Keywords. Goats, Feed, rangelands, pastoral species

Principales espèces végétales pâturées par les caprins dans deux types de parcours en Algérie: montagneux vs Saharien

Résumé. L'objectif de cette étude est de comparer le mode d'utilisation du pâturage et d'évaluer la diversité des espèces végétales pâturées par les caprins dans deux différents écosystèmes : parcours montagneux vs parcours sahariens. Pour cela, une enquête par questionnaire a été réalisée auprès de 100 éleveurs à Tizi-Ouzou (région montagneuse) et 100 autres à Bechar (région saharienne) durant la même période (15 mars-17 mai). A Tizi-Ouzou, l'alimentation des caprins est quasiment (98%) basée sur le pâturage + complément à l'auge alors qu'à Bechar cette pratique est relevée dans 85% des élevages. A Tizi-Ouzou, ce pâturage a lieu en grande partie sur les parcours forestiers, maquis, prairies naturelles et jachères alors qu'à Béchar les chèvres pâturent surtout dans les ergs, regs et lits d'Oueds. Les principales espèces végétales pâturées dans la région de Tizi-Ouzou sont : *Rosa sempervirens*, *Phillyrea angustifolia*, *Myrtus communis*, *Asphodelus microcarpus*, *Sinapis arvensis*, *Hedysarum flexuosum*, *Pistacia lentiscus*, *Calycotum spinosa* ou *Cytisus spinosus*, *Rubus fruticosus*, *Inula viscosa* ou *Dittrichia viscosa*, *Erica arborea* et *Lavandula stoechas*. Par contre, à Bechar, les caprins pâturent surtout : *Cotula cinerea*, *Panicum turgidum*, *Stipagrostis pungens*, *Diplotaxis harra*, *Euphorbia guyoniana*, *Atriplex halimus*, *Tamarix gallica*, *Suaeda mollis*, *Artemisia herba alba*, *Zizyphus lotus*, *Helianthemum lippii*, *Retama retam*, *Moltkiopsis ciliata*, *Erodium triangulare*. Le pâturage est quasiment le mode d'alimentation des caprins dans les deux régions. Il est à noter la richesse de la biodiversité des espèces pâturées dans les parcours sahariens qui est au même niveau voire mieux que la région montagneuse.

Mots-clés. Caprins, Alimentation, parcours, espèces pastorales

I – Introduction

Widely distributed throughout the world, goats are found especially in particularly harsh environments of the planet. Adaptation characteristics such as eating behavior, effective use of feed and, to some extent, tolerance to the disease predispose them to take advantage of the natural resources generally disregarded by other domestic ruminants.

Algerian goat herd (5007894 heads according to FAO, 2017) is characterized by its adaptation to the climatic conditions of the country, and is concentrated mainly in the mountains, the rangelands of the Arid and Semi-arid Zones and Saharan. From an economic point of view, the goat contributes to the income and the cover of milk and meat needs of a large section of the rural population.

In Algeria, several studies have been devoted to the characterization of goat farms in the mountainous regions of Tizi-Ouzou (Kadi et al, 2013, 2016; Mouhous et al, 2016, 2017). Those concerning the conduct of this breeding in the Sharian regions in Algeria are rare (Kadi et al, 2017; Guermah et al, 2018).

Like everywhere around the world (Goetsch et al, 2010), the goat feeding in Algeria is based mostly on the use of rangelands throughout the year whether in a mountain area (Kadi et al, 2016; Mouhous et al, 2016) or in a Saharan zone (Kadi et al, 2017). Therefore, the objective assigned to this study is to compare the pasture use and to evaluate the diversity of plant species grazed by goats in two different ecosystems: mountainous vs. Saharan range.

II – Materials and methods

1. Description of study areas

Tizi-Ouzou (see official website <http://wilaya-tiziouzou.dz/>) is located on the central coast of Algeria and characterized by an 80% mountainous relief, an average altitude of 800 m, a predominantly rural population (63%) and a Mediterranean-style climate wet and cold in winter and dry and hot in summer. Nearly half the area of this country is occupied by natural vegetation. The region is described in a previous work by Kadi et al. (2014) and available at the following link: <http://om.ciheam.org/om/pdf/a108/a108.pdf>

With an area of nearly 162 000 Km² (ANDI, 2013) and 1150 km away from the capital Algiers, Bechar is the largest wilaya - district - in southwestern Algeria. It is characterized by five main reliefs: the mountains (bare and sometimes high), the wadis (in number of six), the valleys (the main ones are Zouzfana, Guir Saoura), the Regs (vast rocky expanses) and the ergs (massive dunes up to 300 m high). The wilaya of Bechar is characterized by a desert type continental climate. There are two types of zones (ANDI, 2013). The transition zone is very hot in summer (+ 45 ° C) and cold in winter (2 ° to 3 ° C) with rainfall of about 60 mm / year and frequent and often violent sand (100 km / h). The desert zone characterized by rainfall of the order of 40 mm / year and very frequent sandstorms. According to DSA (2016), the Bechar wilaya is characterized by a total agricultural area of nearly 1.5 million ha of which only 2.5% (35000 ha) is useful. The rest is the pasture and course. In the livestock sector, with nearly 64 000 head of which nearly 53 000 are goats, goats are in second place after sheep (220 000 head) and before camels (17 000 head) and cattle (2600 heads).

2. Methodology

A questionnaire survey was carried out among 100 random breeders in Tizi-Ouzou (mountainous region) and another 100 in Bechar (Saharan region) during the same period (15 March-17 May). A preliminary survey was conducted using a structured questionnaire as a basis for discussions with farmers. This questionnaire is structured in several sections including

the identification of farms, the situation and the socio-economic profile of the farmer, the management of livestock in general and feeding in particular. To complete the information collected through the questionnaires, interviews were conducted with all farmers in both regions. Beforehand, the collection of information on the location of farms was carried out through direct contacts with agricultural subdivisions, veterinarians, goat milk collection centers and dairies. The data collected, after tabulation of the questionnaires, was coded and recorded in a database designed with Microsoft Excel® 2013 software. The data presented here concern the feeding part.

Descriptive statistics (means, standard deviations and proportions) were calculated for the feeding parameters. Grazed plant species were identified according to the breeders by their common name in Amazigh language in Tizi-Ouzou and Arabic in Bechar and then identified by their scientific name according to the literature in the field.

III – Results and discussion

In Tizi-Ouzou, the goat's diet is almost (98%) based on grazing + supplement to the trough while in Bechar this practice is noted in 85% of the farms. In Tizi-Ouzou, this grazing takes place largely on the forest rangelands, maquis, natural meadows and fallows while in Bechar the goats graze especially in the ergs, regs and beds of Wadis (Table 1).

Table 1. Goat feed calendar at the level of the two wilayas surveyed

Month		Jan.	Febr	Mar	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
rangelands	Tizi-Ouzou	++	++	+	+	++	++	++	++	++	++	++	++
	Bechar	+	+	+	+	+	+	+	+	+	+	+	+
Cultivated fodder	Tizi-Ouzou	+	+	++	++	++							
	Bechar												
Hay	Tizi-Ouzou	++	+								+	++	++
	Bechar	+	+				+	+	+	+	+	+	+
stubble	Tizi-Ouzou							++	++				
	Bechar												
concentrated feed	Tizi-Ouzou	++	++	+	+	++	++	++	++	++	++	++	++
	Bechar	++	++	+	+	+	++	++	++	++	+	+	++

Degree of use: ++ intense; + average

The main species grazed in the mountainous region in Tizi-Ouzou (Table 2) are thirteen.

Table 2. Main grazed plant species in Tizi-Ouzou (mountainous region)

Scientific name	Tamazigh name
Rosa sempervirens	Ti3fart
Phillyrea angustifolia	Tametwala
Cytisus spinosus	Ouzou
Myrtus communis	Arihan
Asphodelus microcarpus	Avarwaq
Sinapis arvensis	Achenaf
Hedysarum flexuosum	Tasula
Pistacia lentiscus	Imidek
Rubus fruticosus	Anajel
Inula viscosa	Imidek
Dittrichia viscosa)	Amaguer Aman
Erica arborca	Akhelendj
Lavandula stoechas	Amezir

While, the main species grazed in the Saharan region in Bechar (Table 3) are fifteen

Table 3. Main grazed plant species in Bechar (Saharan region)

Scientific Name	Name in Arabic
Diploaxis harra	الحارة
Euphorbia guyoniana	ام البينة
Atriplex halimus	القطف
Suaeda mollis	السويد
Stipagrostis pungens	سبط
Artemisia herba alba	الشيح
Zizyhus lotus	السدره
Suadea fruticosa	السويد
Cotula cinerea	القرطوفة
Panicum turgidum	ام ركبة
Helianthemum lippii	رقيق
Retma retam	الرتم
Molkiopsis ciliata	الحلمة
Erodium triangulare	الرغام
Tamarix gallica	التلايا

IV – Conclusions

Pasture is almost the goat's diet in both regions. It should be noted the rich biodiversity of grazing species in the Saharan range which is at the same level or even better than the mountainous region in this study.

Acknowledgments

The authors gratefully acknowledge the breeders for their availability.

References

- ANDI 2013.** Monographie de la wilaya de Bechar. <http://www.andi.dz/PDF/monographies/Bechar.pdf>
- DSA 2016.** Direction des services Agricoles de la wilaya de Béchar
- Goetsch AL, Gipson TA, Askar AR and Puchala R 2010.** Invited review: Feeding behavior of goats. *Journal of animal science*, 88(1), 361-373.
- Guermah H, Kadi SA, Mouhous A, Dahmani M and Chebabha S 2018.** Caractérisation de l'élevage caprin en zone steppique : Région de M'sila (Algérie). *24^{èmes} Rencontres Recherches Ruminants, Paris (France), 5 et 6 Décembre 2018.*
- Kadi SA, Djellal F and Mouhous A 2016.** Pratiques alimentaires dans les élevages caprins dans la région montagneuse de Tizi-Ouzou en Algérie. *Options Méditerranéennes, Série A, N°115, 249-252.*
- Kadi SA, Hassini F, Lounas N and Mouhous A 2014.** Caractérisation de l'élevage caprin dans la région montagneuse de Kabylie en Algérie. *Options Méditerranéennes, Séries A, 108, 451-456.*
- Kadi SA, Mouhous A, Gani F, Fiouane R and Djellal F 2017.** Caractérisation de l'élevage caprin dans la région désertique de Béchar en Algérie. Seminar of the Sub-Network on Production Systems & Sub-

Network on Nutrition. Innovation for Sustainability in Sheep and Goats. Vitoria-Gasteiz, Spain, 3-5 October 2017.

Mouhous A, Kadi SA, Berchiche M, Djellal F, Guermah H, Huguenin J and Alary V 2016. Performances de production et commercialisation du lait de chèvre dans les exploitations caprines en zone montagneuse de Tizi-Ouzou (Algérie). *Options Méditerranéennes, Série A, N°115, 469-473.*

Mouhous A, Kadi SA, Djellal F, Berchiche M, Huguenin J and Alary V 2017. Mountain pasture management by goat farmers: case of Kabylia region (Algeria). Seminar of the Sub-Network on Production Systems & Sub-Network on Nutrition. Innovation for Sustainability in Sheep and Goats. Vitoria-Gasteiz, Spain, 3-5 October 2017.