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

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Abstract. The objective of this study was 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, 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*, *lnula viscosa* or *Dittrichia viscosa*, *Erica arborea* and *Lavandula stoechas*. In Bechar, on the other hand, goats graze mainly: *Cotula cinerea*, *Panicum turgidum*, *Stipagrostis pungens*, *Diploaxis harra*, *Euphorbia guyoniana*, *Atriplex halimus*, *Tamarix gallica*, *Suaeda mollis*, *Artemisia herba alba*, *Zizyphus lotus*, *Helianthemum lippii*, *Retama retam*, *Moltkiopsis ciliata* and *Erodium triangulare*. Pasture makes most of the goat's diet in both regions. We observed a rich biodiversity of grazing species in the Saharan range, equal or superior to that of 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 était 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, le 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*, *lnula viscosa* ou *Dittrichia viscosa*, *Erica arborea* et *Lavandula stoechas*. Par contre, à Bechar, les caprins pâturent surtout : *Cotula cinerea*, *Panicum turgidum*, *Stipagrostis pungens*, *Diploaxis harra*, *Euphorbia guyoniana*, *Atriplex halimus*, *Tamarix gallica*, *Suaeda mollis*, *Artemisia herba alba*, *Zizyphus lotus*, *Helianthemum lippii*, *Retama retam*, *Moltkiopsis ciliata* et *Erodium triangulare*. Le pâturage couvre l'essentiel de l'alimentation des caprins dans les deux régions. Nous avons observé une riche biodiversité d'espèces pâturées dans les parcours sahariens, égale ou supérieure à celle de la région montagneuse considérée dans cette étude.

Mots-clés. Caprins – Alimentation – Parcours – Espèces pastorales.

I – Introduction

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

The Algerian goat herd (5,007,894 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 the Saharan region. From an economic point of view, goats contribute to the income and the cover of milk and meat requirements of a large portion 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.*, 2014, 2016; Mouhous *et al.*, 2016, 2017). Those concerning the Sharian regions are rare (Kadi *et al.*, 2017; Guermah *et al.*, 2018).

As elsewhere in the world (Goetsch *et al.*, 2010), goat feeding in Algeria is based mostly on the use of rangelands throughout the year, whether in mountain areas (Kadi *et al.*, 2016; Mouhous *et al.*, 2016) or in Saharian zones (Kadi *et al.*, 2017). Therefore, the objective assigned to this study was 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-tiziouzhou.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 climate: wet and cold in winter and dry and hot in summer. Nearly half the area is occupied by natural vegetation. The region is described in a previous work by Kadi *et al.* (2014).

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* (six in number), 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 sandstorms (100 km / h). The desert zone is characterized by rainfall around 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 arable. The rest is the pasture and rangelands. In the livestock sector, goats (with nearly 53 000 heads) are second after sheep (220 000 heads), before camels (17 000 heads) and cattle (2600 heads).

2. Methodology

A questionnaire survey was carried out among 100 randomly chosen 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 was structured in several sections including the identification of the farm, the situation and the socio-economic profile of the farmer, the management of livestock in general and of feeding in particular, including pastoral species. 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 centres 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 aspects. A sample of farms was constituted to be representative of the goat sector diversity in the two regions according to Kadi *et al.* (2016 and 2017).

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 was almost totally (98%) based on grazing + supplement to the trough while in Bechar this practice was noted in 85% of the farms. In Tizi-Ouzou, grazing takes place mainly on 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

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												
oncentrated feed	Tizi-Ouzou	++	++	+	+	++	++	++	++	++	++	++	++
	Bechar	++	++	+	+	+	++	++	++	++	+	+	++

Degree of use: ++ intense; + moderate.

During all the year, the main species grazed in the mountainous region in Tizi-Ouzou are thirteen (Table 2).

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

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

The main species grazed in the Saharan region in Bechar are fifteen (Table 3), and differ from those of the mountain region.

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

Scientific Name	Name in Arabic
<i>Diplotaxis harra</i>	الحارة
<i>Euphorbia guyoniana</i>	ام البينة
<i>Atriplex halimus</i>	القطف
<i>Suaeda mollis</i>	السويد
<i>Stipagrostis pungens</i>	سبط
<i>Artemisia herba alba</i>	الشيخ
<i>Zizyhus lotus</i>	السدر
<i>Suaeda fruticosa</i>	السويد
<i>Cotula cinerea</i>	القرطوفة
<i>Panicum turgidum</i>	ام ركية
<i>Helianthemum lippii</i>	رقيق
<i>Retama retam</i>	الرتم
<i>Molkiopsis ciliata</i>	الحلمة
<i>Erodium triangulare</i>	الراغام
<i>Tamarix gallica</i>	التلايا

IV – Conclusions

Pasture is almost the goat's diet in both regions. We observed a rich biodiversity of grazed species in the Saharan range which is at the same level or even better than in the mountainous region in this study.

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