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Camel herd management under pastoral system in southern of Tunisia

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Abstract. Camels play an important role in the life of southern Tunisia population with 90% of camel flocks raised in this region. The aim of this study is to describe husbandry and breeding practices, herd structure, traditional veterinary practices and animal production parameters for camels raised under pastoral system. Data were collected from a total of 35 camel owners. Field surveys from 12 delegations of the governorates of Kebili, Tozeur and Medenine were used. Result surveys and statistical analysis of morphometric data highlighted that the only raised camel breed is "Maghrebi" represented by different ecotypes with different body measurements. According to farmers, animals are mainly kept for meat production while camel milk is rarely commercialized (14%) with an average daily yield of 2.5 liters. Pastoralists practice mobile animal husbandry and camels are grouped from November to next March which coincide with oestral season "El hdad". The she-camel reaches sexual maturity at 3 to 4 years while males at 4 to 5 years. Generally, one stallion can cover 20 to 40 she-camels in one season. Regarding the economic importance of camel for southern region inhabitants, a national strategy was established, and many efforts are made in order to improve camel flocks' production in Tunisia.

Keywords. Camels – Southern Tunisia – Pastoral system – Surveys.

Gestion des troupeaux de chameaux sous système pastoral dans le sud de la Tunisie

Résumé. *Les camélidés jouent un rôle important dans la vie de la population du sud Tunisien avec 90% du troupeau élevé dans cette région. L'objectif de cette étude est de décrire les pratiques d'élevage, la structure du troupeau, les pratiques ethno vétérinaires et les paramètres de production des dromadaires élevés sous-système pastoral. 35 enquêtes ont été réalisées auprès des éleveurs dans les gouvernorats de Kébili, Tozeur et Médenine pour la collecte des données. Les résultats des enquêtes et l'analyse des données morphométriques ont montré que la seule race cameline élevée est « Maghrebi » représentée par ses différents écotypes et différentes mesures morphologiques. Selon les éleveurs, les animaux sont principalement élevés pour la production de la viande alors que le lait est rarement commercialisé (14%) avec un rendement journalier moyen de 2,5 litres. Les pasteurs pratiquent la transhumance et les animaux sont groupés entre Novembre et Mars, ce qui coïncide avec la période œstrale « El hdad ». La chamelle atteint sa maturité sexuelle à 3 à 4 ans alors que le mâle à 4 à 5 ans. Généralement, un seul dromadaire peut saillir 20 à 40 chamelles en une saison sexuelle. Vu l'importance économique de l'élevage camelin pour les habitants du sud, une stratégie nationale a été mise en place et plusieurs efforts ont été fournis pour améliorer la production des troupeaux camelins en Tunisie.*

Mots-clés. *Camélidés – Sud Tunisien – Système pastoral – Enquêtes.*

I – Introduction

The camel stock is estimated to be about 37 509 691 in the world (FAOstat, 2019). The family *Camelidae* includes six living species; however, the single-humped dromedary (*Camelus dromedarius*) is the most numerous and widespread of domestic camel specie (Fitak *et al*. 2016). According to the FAOstat (2019), the camel population in Tunisia is around 237 516 heads while the official statistics of Livestock and Pasture Agency (2017) indicates 80,000 females mostly found in the southern region of the country.

Besides to its cultural and patrimonial value, camel breeding is of great economic importance representing an average of 43% of family labor for the population of the South-East of Tunisia (Tardif *et al*., 2014). Many believes were attributed to camel milk as: low cholesterol; cure gastroenterological diseases; cure diabetes; aphrodisiac properties; helping to autistic kids; and cure cancer.

The present paper aims to describe camel pastoral system in southern Tunisia and generate baseline information that will help improve camel production and livestock productivity.

II – Material and methods

The study took place in the governorates of Kebili, Tozeur and Medenine in southern Tunisia. The study sites were selected based on the presence of higher camel population. The distribution of camel owners across the sample's sites are 13, 17 and 5 from Kebili, Tozeur and Medenine governorates, respectively. A survey was undertaken to obtain information on camel husbandry and breeding practices, herd structure, traditional veterinary practices and animal production parameters. In addition, six body measurements were taken on she-camels from different ecotypes and statistical analysis were performed using R software version 3.6.2.

III – Results

1. Camel owner's characteristics

Regarding the level of education among camel owners in the study area, it was found that 35% of them were illiterate, while 27%, 29% and 9% had completed primary school, post-primary school and university studies, respectively. Furthermore, the results showed that most camel owners owned only camel (40%); followed by those who owned camel, sheep and goats (31%); then those who owned camel and sheep (17%). Few of them owned camel and goat (12%).

2. Herd structure and composition

In southern Tunisia, camels are primarily herded for meat production under an extensive pastoral system. More than half of camel owners have stated that they have obtained their herds by heritage. The total number of camels owned in our sample is 3,335 and the overall mean number of camels owned per person was 98. The Maghrebi camel is the only breed raised and it is represented by different ecotypes: in Kebili governorate, we found Merzougui (84%), Ghiloufi (8%) and G'oudi (8%) ecotypes; in Tozeur governorate, Ghribi (41%), G'oudi (24%), Hmadi (23%) and Abidi (12%) ecotypes were encountered and in Medenine governorate, there are Ardhaoui (80%) and crosses (20%).

Other than ecotypes, camels differ by their coat color and their body measurement. In fact, five coat color have been identified, namely: white "Bidha", red "Hamra", Yellow "Safra", blue "Zarga" and blonde "chagra". Concerning body measurements, six measures have been taken namely: neck circumference, neck length, height at hump, height at withers, hindlimb length and forelimb length.

The body measurements were taken on female camels in 23 herds of 11 delegations of southern Tunisia. The correlation coefficients have been calculated in order to measure the relationship between the different body measurements and significant coefficients were recorded between several variables. These coefficients ranged from 0.26 between Height at withers and forelimbs length to 0.73 between forelimb and hindlimb length. The obtained results are in accordance with those of Chniter *et al.* (2013) concerning the significance of the correlations between Height at withers and forelimbs length (0.26 *vs* 0.14) and between height at hump and Height at withers (0.57 *vs* 0.73). The effect of ecotype and age has been also studied. Ecotype has a highly significant ef-

fect (p< 0.001) on the neck length and circumference and on the fore and hindlimbs length. Those results show that even if the classification of animals is based on their tribal affiliation, it could have a phenotypic or even a genetic justification which may be due to the effect of climate and environment (Mahrous *et al.,* 2011; Ishag *et al.,* 2011; Almathen *et al.,* 2012 cited by Abdallah *et al.,* 2012; Chniter, 2013; Meghelli *et al.,* 2020). Regarding age, no significant difference was observed and this could be due to the age of the animals used in this study. For means and standard deviation of the different body measurements, results are shown in Table 1.

Table 1. Means and standard variation of phenotypic body measurements among different Tunisian camel ecotypes

Ecotype	Neck circumference (cm)	Neck length (cm)	Height at hump (cm)	Height at withers (cm)	Hindlimb length (cm)	Forelimb length (cm)
Merzougui	67 ± 7.6	89 ± 16.6	190 ± 8	176 ± 7.4	142 ± 6.8	116 ± 7.4
Ghiloufi	63 ± 4.5	104 ± 5.5	194 ± 8	180 ± 7.1	141 ± 2.1	111 ± 2.7
G'oudi	69 ± 10.6	105 ± 5.1	200 ± 13	175 ± 6.7	139 ± 0.5	112 ± 4.7

The Merzougui camels have longer fore limbs. For the height at the withers, the hindlimb length and the neck circumference, there was no significant difference between Merzougui, Ghiloufi and G'oudi camels, while for the height at the hump, Ghiloufi exceeded the values of the other ecotypes. Regarding the length of the neck, the mean values showed that the Merzougui ecotype has a shorter neck than the others (P <0.05). Those variations could also be due to the activities and the work performed by the dromedary (Tandoh *et al.,* 2018), the environment effect (Meghelli, 2020), the breeding system and the history of those ecotypes, especially from a genetic point of view.

3. Herd management

In most cases, herd management is under the supervision of the camel herder (74%). During the period from September to March, herders stay in a portable tent that give them the flexibility to move around in search of grazing lands and water. The tent includes many utensils such as gas bottle, potable water, ancient stove, pillows, carpets. The camp is set up near to water source. In Tunisia, herders moved their animals between March and October, then camels are grouped, identified using modern (ear tags) and traditional methods (branding), vaccinated and received feed supplementation between September and March which coincides with heat and birth season.

There are also many regular tasks that are carried out by the camel herder such as watering and feeding animals, checking their feet's in search of thorns that would hurt them, investigating diseases and operating them when necessary, detecting pregnant females and watching over them when giving birth. The camel herder should know when the camel is ready to be milked; in fact, she-camels are milked only in the morning and in the evening and the milk is stored in a brown leather bag made of goat skin. Camel milk is an important component of the camel herder diet together with a traditional dish named "Zommita" and which is made of roasted barley-based flour melted with other seeds and components, grinded, sieved and then mixed with olive oil and water. It's important to mention that all pastoralists consider camel milk selling a taboo. Moreover, an experienced camel herder is required to know the tracks that lead to the herd. In case of loss of any of the camels, he must be a good clues detector: he inspects consumed bushes, excrement traces and animals' footprints to find them.

By visiting several farms, we have noticed a difference in the clothing of the camel herder and the owner. The first, who moves a lot and comes into direct contact with the animals, dresses in pants and shirt. As for the second, who controls his herd from afar, he wears loose clothing such as Jebba and only intervenes when necessary. Furthermore, while visiting a camel herd, strict instructions

are given by the herder as well as the camel owner. It's advised not to get too close to the camels, and especially to the stallion, to avoid their aggressiveness. It's also strictly forbidden for fragrant people to approach to newborn camels under one week of age to reduce the risks of their death.

4. Reproduction parameters

Camels are seasonal breeders. In Tunisia, they come into heat during the breeding season, generally from November to April. This period is characterized by low temperature and abundant rainfall. However, camels are more active during the period from December to March. Females are generally first bred at the age of 3 to 4 years old, but some of them might be used at the age of 2 years if they obtained 70% of their adult body weight and they are named "madhlouma". In males, puberty is reached between 3 to 4 years of age. Males are used for breeding from the age of 5 to 6 years old with a mean age of 5.6 years.

Generally, one stallion can breed 20 to 40 she-camels in one season. In the present study, most of the stallions used were autoproducts which can increase inbreeding within the flock. The most important traits in choosing a breeding stallion are, according to camel owners, their mother's milk production rate, coat color, tail length and size, neck length and testis size. For the remaining herds, stallions were purchased; for Medenine and Tozeur camel owners, stallions are generally bought from Tataouine and Kebili (Douz). Whereas, for Kebili camel owners, stallions are purchased from Tataouine. It's important to mention that, over 29% of the herds, have no breeding camel within a flock size ranging from 5 to 30 heads. In this situation, stallions are borrowed from neighbors camel owners.

Concerning she-camels, the signs of pregnancy are frequent urinating and carrying the tail in the horizontal position in the presence of the male or even in the presence of foreign visitors, according to camel herders. The gestation period is about 12 to 13 months. Our finding shows that this period ranged from 365 to 389 days with a mean of 367 days. Most calves are born from January to February. According to the informants, some cases of calves' mortality and she-camels injury have been recorded following jackal attacks. Before giving birth, she-camel loses appetite, separates itself from the herd and hide behind bushes. Most of the time, she-camels did not need any human assistance; nevertheless, the herder must stay close to the camel in case of any dystocia. Calving interval is around 2 years, still shortening it will ensure better productivity and profitability of the herd.

5. Production parameters

In southern Tunisia, meat is the main product of the camels. In fact, calves are sold between 7 and 17 months of age with a body live weight ranging from 100 to 250 kg and a price ranging from 1200 to 1500 TD (Tunisian Dinars).

Concerning milk production, camel owners and herders selected the breeding dairy she-camel based on phenotypic traits, such as developed milk vein, size of the udder, teats length and a large abdomen. Lactation duration is from 16 to 19 months where the presence of the calf during milking is imperative. She-camels are milked once (20%) to twice (80%) per day and the average daily milk yield per she-camel is 2.5 liters (marked by a large variability ranging from 1 to 10 liters). It's important to mention that, in the study area, camel milk is though to have medicinal and therapeutic properties. In fact, this milk is widely used to reduce the blood glucose level and to treat blood cancer especially when it's mixed with urine in addition to it's use in the improvement of the healing of fracture bone due to it's high level in Calcium.

A. Culling

Since livestock is bred to produce meat or milk, the herd must be culled to a certain rate. In this study, out of 35 camel owners, 24 have recourse to culling. Age was the most prevalent reason of

culling (67%) followed by infertility (21%) and health state (12%). The rest of the camel owners (31%) refuse to cull their animals regarding their close relationships with them. In fact, camels represent not only a source of income for the pastoralists, but also their identity.

B. Calf management and weaning

Among the camel owners interviewed in Kebili, Tozeur and Medenine, most camel of them wait the calf to wean naturally. However, for the rest, they practice abrupt weaning using traditional techniques such as udder nets named “chmel” which covered the teats and prevented the calf from suckling. Other methods are used such as the impregnation of the calf with lime or with his mothers’ excrement so that she could no longer recognize her baby’s smell and she flee from him. Camel owners wean calves at an age ranging from 6 to 18 months and with a mean age of 11 months. In fact, calves fattening is not widely practiced in the study area and this is due to the high cost of feed products.According to our results, 91% of camel owners have problems related to the procurement and payment of those feeds. For the sale of calves, 69% of the interviewees stated that they sell their animals just after weaning at a mean age of 12.7 months. The age of sale ranges from 7 to 24 months.

Concerning female young camel, commonly known as “Bakra”, they are rarely sold. The sale is generally sporadic and if necessary. In fact, the State is proposing a subsidy on the conservation of young female camels in order to increase the number of female units and to conserve the national herd. This grant is 700 TD spread over 3 tranches and is subject to several conditions.

6. Camel health management and ethno-veterinary medicine

Organized annual campaigns are carried out by the office of livestock and pasture and the veterinary service during the period October to March, to control trypanosomiasis and scabies. Other than vaccination, this campaign includes animal identification using tags and young females rearing subsidization. Furthermore, our findings show that all camel owners need private veterinarian services. The common diseases that infect camel in the study area are scabies, camel pox, ringworm and trypanosomiasis. However, the control of those diseases remains difficult due to herd mobility and farms dispersion.

Thus, 57% of the interviewees turned to ethno-veterinary remedies of camel diseases refering to “the knowledge, skills, methods, practices, and beliefs about animal health care found among the members of a community” (McCorkle, 1986). The results revealed that the traditional healthcare practices adopted to cure skin diseases such as scabies, as well as mastitis is tarring. The tar is extracted from a shrub called “retem” (*Retama raetam*). The camels suffering from ringworm, commonly known as “guarâa” or “El âarr”, are treated either with burnt diesel oil (heated in winter and cold in summer) or with milk and salt. The local healers fed a mixture of caraway, fenugreek and coriander seeds to camels having abdominal bloating. Fenugreek seeds are also used to stop diarrhea. The routine practice followed by the local healers against respiratory diseases is cauterization of the armpits and neck and ocular affections, such as keratoconjunctivitis, are treated with crushed glass which is sprinkled on the animal’s eyes.

IV – Conclusion

In the study area, camels are traditionally reared under pastoral production system and they are mainly herded for meat production. Camel milk, which is characterized by its therapeutic value, its sale is always considered a taboo. Camel owners are facing various constraints such as high feeding costs, diseases and jackal attacks. For future prospects, national efforts should be made to convince camel owners to invest in milk production. Also, to put the bases for the implementation of a modern system of selection for morpho-functional traits of economic interest to increase drom-

edary productivity in Northern Africa. More investment and governance in the camel sector are needed. The new strategy should give a clear direction on how and in which way we can boost camel owners' investment and agribusiness development and foster camel milk trade.

References

Abdallah, H.R. and Faye, B., 2012. Phenotypic classification of Saudi Arabian camel (Camelus dromedarius) by their body measurements. *Emirates Journal of Food and Agriculture*, 24 (3), 272-280.

Chniter, M., Hammadi, M., Khorchani, T., Krit, R., Benwahada, A. and Ben Hamouda, M., 2013. Classification of Maghrebi camels (*Camelus dromedarius*) according to their tribal affiliation and body traits in Southern Tunisia. *Emir J. Food Agric.*, 25, 625-634.

FAOSTAT 2019, "FAO Statistics, Food and Agriculture Organization of the United Nations", Rome, 2017. http://www.fao.org/faostat/en/#data/QA

Fitak, R.R., Mohandesan, E., Corander, J. and Burger, P.A., 2016. The de novo genome assembly and annotation of a female domestic dromedary of North African origin. *Molecular ecology resources*, 16(1), 314-324.

Ishag, I.A., Eisa, M.O. and Ahmed, M.K.A., 2011. Effect of breed, sex and age on body measurements of Sudanese camels (*Camelus dromedarius*). *Australian Journal of Basic and Applied Sciences*, 5 (6), 311-315.

Mahrous, K.F., Ramadan, H.A., Abdel-Aziem, S.H., Abd-El Mordy, M. and Hemdan, D.M., 2011. Genetic variations between camel breeds using microsatellite markers and RAPD techniques. *J. Appl. Biosci,* 39, 2626-2634.

McCorkle, C.M., 1986. An introduction to ethnoveterinary research and development. *J. Ethnobiol*, 6, 129-149.

Meghelli, I., Kaouadji, Z., Yilmaz, O., Cemal, I., Karaca, O. and Gaouar, S.B.S., 2020. Morphometric characterization and estimating body weight of two Algerian camel breeds using morphometric measurements. *Tropical animal health and production*, 2020 Sep, 52(5): 2505-2512.

OEP, 2016. Rapport sur la stratégie nationale pour l'amélioration du secteur d'élevage camelin vers 2020. Office de l'Élevage et des Pâturages.

Tandoh, G., Gwaza, D.S. and Addass, P.A., 2018. Phenotypic Characterization of Camels (*Camelus dromedarius*) in Selected Herds of Katsina State. *Journal of Applied Life Sciences International*, 1-11.

Tardif, N., Jaouad, M., Khorchani, T. and Faye, B., 2014. Contribution of camel breeding to the household economy in southeast Tunisia. In: *Options Méditerranéennes*, Series A, no. 109.