Camel breeding development project in Tunisia

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Abstract

Camel breeding is of great socio-economic importance in southern Tunisia. Although, the size of the national camel herd has decreased over the years from 120 000 to 56 000 heads in 2014. Illegal export, low breeding efficiency, social modernization and lack of investment are the major causes of this decline. To remedy this situation, the Tunisian government has established a national program for development and research on camel production. This program is based on grants to farmers to encourage rearing of replacement females and fattening camels; improvement of pastures and water infrastructure, promotion of applied research in specialized centers. Research efforts are centered on health, nutrition and improvement of rangelands, development of reproductive biotechnologies and genetic improvement. An attempt was carried out to genotype the local breeds of camels. Development of semen preservation and artificial insemination has met several challenges inherent to the peculiarities of reproduction in this species.

Keywords: Husbandry, reproduction, biotechnologies, Camel, Tunisia

Projet de développement de l'élevage camelin en Tunisie

Résumé

L'élevage du dromadaire joue un rôle socio-économique important dans le sud tunisien mais le nombre de dromadaires a connu ces dernières années une diminution importante de 120 000 à 56 000 en 2014. L'exportation illégale, le rendement faible de l'élevage, la modernisation de la vie des personnes et le manque d'investissement dans ce domaine sont les principales causes de cette diminution. Pour remédier à ce problème, l'état tunisien a proposé un programme national de développement et de recherche dans le domaine du dromadaire basé sur (1) l'encouragement des éleveurs par la subvention de l'élevage des femelles de remplacement et l'engraissement des chamelons, (2) l'amélioration des infrastructures dans les pâturages; notamment l'aménagement des points d'eau pour les animaux et (3) la promotion de la recherche appliquée dans les centres spécialisés. Les principaux thèmes de recherche sont axés sur la santé animale, l'alimentation des dromadaires et l'amélioration des zones de parcours, l'insémination artificielle et le transfert d'embryon et la sélection génétique des animaux. Dans le domaine de la biotechnologie de la reproduction, des essais ont été réalisés dans le typage génétique des dromadaires, la conservation du liquide séminal et l'insémination artificielle pour surmonter les difficultés particulières de la reproduction chez le dromadaire.

Mots-clés: Élevage, reproduction, biotechnologies, dromadaire, Tunisie

INTRODUCTION

Dromedary camel (*Camelus dromedarius)* represents an important economic resource to many arid areas in the world. This multipurpose animal is used as a pack animal and provides milk, meat, fiber and hide. In Tunisia, dromedary farming is considered an important activity for its ecological, economic and social impacts especially in the southern region. Three breeding systems can be distinguished. The "transhumant extensive system in Kebili and Tataouine provinces", the "extensive system in Mahdia province", and the" intensive system in Kairouan province" (Moslah *et al*., 2004).

IMPORTANCE OF CAMEL PRODUCTION

Camels contribute to the ecological balance and maintaining the biological diversity of the Tunisian ecosystem. It takes advantage of many pastoral varieties that cannot be used by other species of animals.

Dromedaries are distributed across 1.2 million hectares of desert land and bogs. The size of camel herds has decreased from 120 000 heads in 2009, to 56 000 heads (with 40 000 females) in 2014 (Ben Salem, 2016). Meat production averages 2500 tons per year, while milk production, which is mostly for household consumption, is estimated at 12 000 tons per year (Ben Salem, 2016). Camel milk is much appreciated in the Tunisian society because of its claimed health benefits (Kammoun and Jammali, 2012). In addition to meat and milk, camel fiber and leather have an annual yield of approximately 30 tons and 575 tons respectively (Ben Salem, 2016).

GEOGRAPHICAL DISTRIBUTION

Most of the Tunisian dromedary herds (91%) are located in the south of the country which is characterized by a pastoral style (Figures 1, Figure 2).

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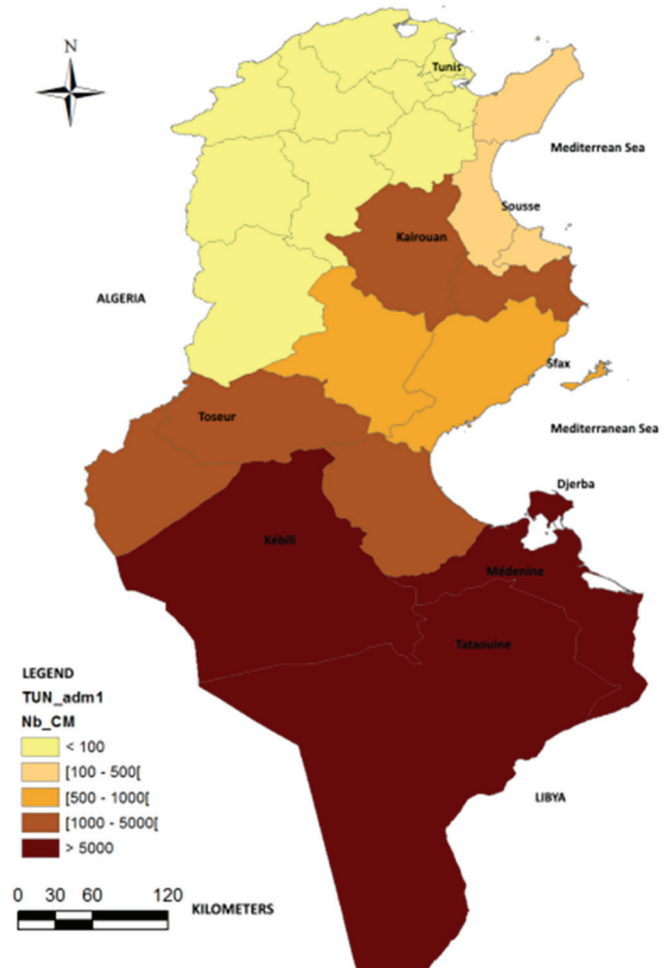

Figure 1: Camel distribution in Tunisia

Figure 2: Typical range for extensive dromedary rearing in Tunisia

THE NATIONAL PLAN FOR THE DEVELOPMENT OF THE CAMEL PRODUCTION SECTOR

The major causes of the camel production decline

In Tunisia, the deterioration of camel production sector is reflected by the dramatic decrease in the national dromedary herd size which dropped from 225 000 heads in the 1950s to 80 000 heads in the 1990s and only 56 000 heads recently. This remarkable reduction can be explained by several reasons related chiefly to the social and economic status (Al-Saiady *et al.*, 2012). Insufficiency forage resources owing to successive harsh and prolonged droughts in recent years, have led to the deterioration of natural pastures in southern Tunisia. In addition, other socio-economic development programs in the country have been made at the expense of good pastures. Other important factors include the lack of optimization of camel products. These include the lack of progress in the processing and marketing of camel milk, fiber and leather. On the other hand camel meat production remains the main economic driver of the sector.

On the structural level too, the sector is still disorganized because of the lack of standardized marketing regulations, the limited contributions of development associations and the poor participation of breeders in professional structures.

On a technical level, the sector suffers from several deficiencies. Research on camel genetic improvement and disease prevention is still at its beginning (Jemli *et al.*, 1995). Moreover, there is a lack of training centers for camel breeders and structures for technical support. These has resulted in the lack or insufficient trained specialists to cover the needs in camel rearing areas.

There is also a significant financial constraint in the sector. The government grants provided for the development of other species are not available for production of dromedary replacements females. Also, bank loans for startups or expansion of breeding operations are hard to obtain. This is exacerbated by the lack of organization of the camel sector compared to the cattle production sector which greatly impacts funding.

Strategic objectives for the camel sector improvement

The national plan for the development of the camel sector is aimed at the increasing of the size of camel herds, along with the achievement of self-sufficiency in red meat and the preservation of the environmental balance by the improvement of the desert and salt pastures that are only exploited by camels.

Besides, one of this governmental program goal is to ensure the breeders maintenance in their own areas by enhancing their incomes, as well as to integrate camel breeders within professional structures and to supporting camel shows and festivals too.

National program for camel sector development

Measures for camel herd development

To increase the number of females, the Tunisian government offers grants for rearing replacement females of the "*Bakary*" category. This strategy aims to offset the long interval from birth to mating (4 years) by encouraging owners to retain replacement females instead of selling or slaughtering them.

These grants, which are to the amount of $300 USD per head, are given in three installments: 20% at the birth of camel calf, 40% at the age of 12 months, and 40% at the age of 36 months. In addition, grants of $75 USD per head are given to breeder to improve weight of young camel before the slaughter.

Measures to increase camel production and to improve herd profitability

Different measures have been taken to increase camel production and to improve the herd profitability and are summarized in Table 1.

Measures to organize the camel sector.

In order to create a special financial path for the camel sector and to improve its organization, the government invested in camel breeding (Faye *et al*., 1997). Measures have been taken to develop industrialization of camel products. For fiber a specialized label was created. Also a model project was developed for the tanning of hides to promote the industry of leather and fibers (Riyadh *et al*., 2012). In the dairy sector, efforts have been made in the collection, processing and distribution of camel mild. Finally, for camel meat, a system of classification according to quality has been developed. All these efforts are combined to customer education on special characteristics as well as health and nutritional benefits of camel products.

GENETIC IMPROVEMENT THROUGH ARTIFICIAL INSEMINATION AND EMBRYO TRANSFER

Mastering reproduction is the best tool for any successful breeding. This required introduction of biotechnologies to improve productivity (Chokri, 1995). In the field of reproductive biotechnology, attempts have been made to genotype camels, semen preservation and artificial insemination, and use of ultrasonography for pregnancy diagnosis. However, success of these techniques applied to the dromedary in Tunisia was limited compared to the cattle sector (Musa *et al*., 2006).

Artificial insemination is the key to improve the reproductive performances of all species, including the dromedary. Its use allows a better reproduction management, genetic progress, disease control, cost effectiveness and safety.

The first successful artificial insemination of synchronized females Maghrebi camels was achieved in the Arid Lands Institute of Médenine in Tunisia in 2014 (Seddik *et al*., 2014). The experiment was carried out during the breeding

Table 1: Measures to increase camel production and to improve herd profitability in Tunisia

Programs	Measures
- Improve camel production and develop herd profitability	- Encourage camel fattening and milk collection. - Reinforce the control of random slaughter and camel product smuggling.
- Improve camel herd genetics	- Generalize identification of animals, establish a program for the control of production (meat, milk, etc.) - Use genetic characterization (Ould Ahmed, 2009)
- Support health care	- Modernize laboratories for diagnosis of major diseases in the South of the country (Arid Lands Institute of Médenine, the Veterinary School and the National Agronomic Institute of Tunisia) - Epidemiological disease surveys to prioritize health action on the most serious disease like Surra (*Trypanosoma evansi*), Mange, Camel pox, Ticks infestation, etc. - Improving preventive health coverage (free vaccination and antiparasite treatment)
- Improvement of human resources in the camel sector	- Conduct a detailed study on competence needs in the camel sector - Review and update professional training programs as well as agricultural higher education programs related to the camel sector - Organize training sessions for all actors involved camel production (breeders, technicians, veterinarians, etc.)

Table 2: Some reproduction performances in the Tunisian dromedary

Parameters	Values	References
Seasons of sexual activity	December to March	Minoia *et al*., 1992
Estrous cycle length	15 days	Hammadi, 2003
Female breeding age	3 à 4 years	Moslah and Megdiche, 1989
Gestation duration	387.6 days	Moslah, 1990
Uterine involution period	38 à 42 days	Slama *et al.*, 1999
Interval [Birth of camel calf - Fertile mating]	41.2 days	Hammadi *et al*., 2001
Interval [Birth of camel calf - Birth of camel calf]	24 months	Hammadi, 2003
Post-partum mortality rate	13-50%	Burgemeister, 1974 .

season (January-Mars 2014) and lasted 66 days (35 days of preparation for the AI and 31 days of pregnancy follow-up). Artificial insemination was performed with fresh semen.

During this experiment, a hormonal treatment was applied to 8 camel females, each one of them received 500µg of clospostenol (PGF2α), and one week later, 3 intramuscular shots of 20µg Buserelin (GnRH agonist) each, with an interval of 14 days

The follow-up of the ovarian activity was monitored by transrectal ultrasonography of the ovaries at the second and the third injections of GnRH, and also by a weekly progesterone level determination. The artificial insemination was carried out 24 h after the last injection of GnRH on camel females having each one at least one follicle with a diameter larger than 1 cm, by deposing 2 ml of fresh semen (648x106 spermatozoa/ml and 75% mass motility) into the uterine body.

The results showed that 5 females out of 8 ovulated after the first injection of GnRH, and starting from the second injection, seven females were synchronised, and inseminated after the third injection of GnRH. Two females were found pregnant. The conception rate was 28.6%.

The sector organization is similar to the cattle's one, therefore, it's important to establish a specialized center in artificial insemination, to monitor the performance in camels and to improve the staff skills through technical training (veterinarians and technicians).

CONCLUSION

In Tunisia, dromedary farming remains a traditional activity with low reproductive efficiency (fertility rate and viability of calves) and average production of meat and milk. Its development is hampered by various zootechnical and health problems.

The promotion of the dromedary sector will require is sound program which include research, training and extension component in the management of animal and reproductive health and the improvement of production and commercialization of meat, milk, fiber and hide.

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