Camel Research and Development in the Sudan

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ABSTRACT

Camel population in the Sudan exceeds four million and is raised mainly in a belt north of 12 N latitude. The most densely populated areas are Kordofan, Eastern and Darfur states, followed by other regions in the central and Northern provinces. The camels are owned mainly by transhumant pastoralists as a source of milk and meat as well as pack and riding animal, as a source of local and foreign trade and recreation. Over decades, extensive research has been conducted on Sudanese camels. The paper highlights the research on camels since the turn of the last century, the institutions where this research has been executed, areas that need more emphasis of research. Many national and international conferences and workshops have been organized in the Sudan. Most important of these was the international workshop on camel research and development that was held in 2002. This workshop instituted sound research agenda for a decade that ended this year. The research agenda of this workshop as well as future research topics have been recommended.

Key words: Camel, Research, Development, Sudan

INTRODUCTION

Camel population in the Sudan exceeds four million (MARFR, 2005) and is raised mainly in a belt north of 12 N latitude (Fig.1). The most densely populated areas are Kordofan, Eastern and Darfur states, followed by other regions in the central and Northern provinces (Table1). The camels are owned mainly by transhumant pastoralists as a source of milk and meat as well as a pack and riding animal.

CHRONOLOGY OF RESEARCH AND INVESTIGATIONS

From 1902 to date

Over decades, extensive research has been conducted on Sudanese camels. An annotated bibliography well documented the published research in camels during the period 1905-2006 (Majid 2006). The development of the camel research in the different research institutions may be summarized as follows:

1902 - 1970:

The first three decades of this period (1902 – 1927) are regarded as the period of establishment of veterinary services in the Sudan. The main thrust of camel research during the period was directed to camel trypanosomiasis diagnosis and treatment (Knowles, 1924). A formol gel diagnostic test was developed in 1923 and mercuric chloride by Bennett (1928).

A major landmark during this period was the establishment of the Veterinary School in 1938.
Helminth parasites of the camel were recorded by Malek (1959). Interest in the camel anatomy was initiated by Kanan (1973) who devoted much of his time and effort to the anatomy of the camel.

This period was characterized by camel research on anatomy, morphology and histology by Arnautovic and Abdalla (1969). Blood and milk constituents and endocrinology were studied by Holler and Hassan (1965). Camel’s husbandry was described by Gillespie (1962). The status of trypanosomosis was reviewed by Karib (1961).

1971 - 1980:

About 25% of the camel research and studies were conducted during this period. The major areas covered were camel reproduction (Musa 1980) camel endocrinology, enzymes and haematology research was continued (Harvey and Obeid 1974; Tartour, 1971).

The end of the seventies witnessed the increased awareness of the camel as an important animal in arid and semi-arid areas. Considerable information on its research and studies was collected and exchanged through the International Foundation for Sciences (IFS) workshop on camels in Khartoum (IFS, 1979), workshop on camels in the Arab countries (AOAD, 1980).

1981 - 1990:

About 45% of camel research and studies were published during this period. This increase could be attributed to the establishment of the Camel Research Unit at the Faculty of Veterinary Science. The major areas were camel diseases, physiology, production, reproduction, anatomy, and camel nomadism.

The period was characterized by documentation of camel research and studies: ACSAD Camelid Bibliography (Farid, 1981), UNSO Analytical and Annotated Bibliography (Wilson et al., 1990). The Camel Newsletter was published by ACSAD and the camel Network was established. The Camel Research Project was implemented at the Faculty of Veterinary Science, University of Khartoum.

1991 - 2000:

About 13% of the camel research and studies were published during this period. The majority of these studies were diseases, husbandry, economics and reproduction. The implementation of Butana Project contributed substantially to nutrition, diseases, herd dynamics and socio-economics of camel herders.

Brucella abortus biovar 3 was reported for the first time by Agab et al., (1994). Seasonal morbidity and mortality and camel calf diarrhoea among camels was studied by Agab (1993).

Studies on the socio-economics of camels were reported by Sakr and Majid (1998, and 2000).

The period was characterized by the establishment of the National Camel Research and Development Committee, The National Council for Camel Research and Development, The Butana Camel Research Project in El Shuwak, The Camel Research Centres in Tambul and El Rahad, the ACSAD Camel Research conference in Khartoum.
which was followed by the establishment of Camel Applied Research and Development Network in the Sudan.

2000-2006:

About (118) research studies were executed during this period as M. Sc or Ph.D. theses (60) or research proposal (58). This is almost 18% of the entire published work on camels in the Sudan. Studies to elucidate the causes of camel calf diarrhea were executed during this period. Such studies have identified *Toxoplasma gondii* (Ishag *et al.*, 2004, 2005, and 2006), Rotavirus (Osman, 2004) and *Clostridium perfringes* (Abbas, 2004) as potential causes of this syndrome. Trypanosome diagnosis (Aradiab *et al.*, 2005), Helminth survey (Azrag, 2005), hydatidosis (Mukhtar, 2002, Omer *et al.*, 2006) camel mastitis (Ismail, 2006) have been investigated.

Production parameters (Ali and Majid, 2006); Bakheit and Majid (2006) and endocrinology were also reported during this period as well as the use of molecular genotyping typing of the different camel types in the Sudan (Ismaeel, 2005, Hashim, 2009). A study on camel marketing was published during this period (Idris, 2003). More studies were conducted on the socioeconomic of camel raising (Sakr and Majid, 2002).

**CAMEL RESEARCH AND DEVELOPMENT INSTITUTIONS**

**Sudan Veterinary Services (SVS):**

The first institute dealing with camel research as early as 1902 was the Sudan Veterinary Service. The emphasis of SVS was research on camel diseases, mainly trypanosomiasis. The activity was passed to Central Veterinary Laboratory which was established at the beginning of the century and later on to the Central Veterinary Research Laboratories and its regional laboratories.

**Faculty of Veterinary Science, University of Khartoum:**

The Faculty of Veterinary Science started as a Veterinary School in 1938 and developed into a Faculty of Veterinary Science in the University of Khartoum. The Faculty conducted research on the basic sciences of camel such as anatomy, morphology, histology, histochemistry, biochemistry, physiology, husbandry, nutrition, pathology, parasitology, epidemiology, reproduction and production.

**CAMEL RESEARCH AND DEVELOPMENT COUNCIL:**

The (CRDC) was established in the Ministry of Animal Resources in 1992/93. The objectives of (CRDC) were:

- Camel Research Policies
- Augmentation of camel research in the universities and institutions and improvement of services to camel raisers.
- Increase awareness of the importance of the camel as meat and milk animal.
- Encouragement of camel scientists and establishment of links between them at national and international levels.

The (CRDC) identified five areas as Camel Research Centres: El Shuwak, El Rahad, Um Shadidah, Tambul and Kutum.

**El Shuwak Camel Research Centre:**

The major objectives of the Centre were:

- Encouragement of camel research studies in the Butana area.
- Range rehabilitation and management.
- Improvement of camel farming systems
- Improvement of camel veterinary services.

**Tambul Camel Research Centre:**
This is located in Tambul in Gezira State in Central Sudan.

**The objectives of the centre are:**
- Survey of camel production, reproduction and husbandry systems.
- On-station research on diseases caused by parasites, bacteria, viruses and ectoparasites.
- Increased awareness of the importance of the camel as meat and milk animal.
- Encouragement of camel scientists and establishment of links between them at national and international levels.

**THE CAMEL APPLIED RESEARCH AND DEVELOPMENT NETWORK (CARDN)**
(CARDN) was established in ACSAD in 1996 with support from IFAD and the French government (CIRAD). Sudan has joined the network in January 1997.

Proposed Research Areas of CARDN were:
✅ Camel Production Systems
✅ Camel Nutrition
✅ Camel Diseases
✅ Socio-economic studies

Examples of the research projects put forward were:

(a) **Causes and Epizootiological Studies on Camel Calf Diarrhoea:**
This syndrome is quite prevalent and some workers believe that it is one of the major causes of the reduced herd growth observed in camels.

The causes of this syndrome could be diverse from infections, nutritional or due to the type of husbandry and certain nomadic practices. The wide scope of the problem should, therefore, include different fields of study. **Rota** virus, **T. gondii** and **Cl. Perfrigens** have been isolated from diarrheic calves from River Nile, Gadarif and Kordofan states.

(b) **Intensive Camel Production**
This project comprises research in areas of feeds, meat, and milk production and processing in intensive systems of camel production (Ahmed, *et al*, 1997)

**CONFERENCES AND WORKSHOPS**
A number of conferences and workshops on camels have been organized in the Sudan. These included:
1- The first International workshop on camels in 1979 (IFS)
2- The camel workshop on initiating a camel ranch in the Sudan in 1980 (AOAD)
3- The ACSAD workshop in July 1997 where the Sudan has joined the Camel Applied Research and Development Network (CARDN)
4- The International Workshop on Camel Research and Development: Formulating a Research Agenda for the Next Decade (DAAD and ARRC, 2002)
5- CARDN workshop in 2003 for establishing inter-regional society for camel herders (CARDN)
6- The Sudan University of Science and Technology (SUST) workshop on camels in 2007

Of all these workshops, the one organized by DAAD and ARRC, adopted the same themes of the present conference and came out with the following identified agenda

**Nutrition and Management**
1. Nutrient requirements and feeding standards for all classes of animals
2. Evaluation of available feeds and forages
3. Grazing systems and resource utilization patterns
4. Reproduction and reproductive efficiency
5. Production systems and system performance milk
6. Production systems and system performance meat
7. Working performance (draught, loading, riding, leisure)

**Breeding and Genetics**
8. Breed identification and genotype description
9. Genetic bases of productivity parameters
10. Improved reproductive efficiency
11. Methods and programmes for breed improvement
12. Conservation of genetic diversity

**Camel Health**
13. Production (intensification) related diseases
14. Environmental change related diseases
15. Ethno-veterinary (traditional) medicine
16. Food safety and (hygienic) product quality
17. International and public health issues

**Camel Products**
18. Quality and processing of milk
19. Quality and processing of meat
20. Product marketing and consumer preferences
21. Added value products (by-products)

**Socio economics**
22. Social integration of camel production systems
23. Economic importance and function
24. Production economics
25. Market structures and development

**SWOT** (Strength, Weakness, Opportunities and Threats) analysis of the present situation of research and development in camels in the country would reveal the following:

**1- Points of strength**
- A large number of camel population over almost all the country ecozones
- Awareness of the economic and social value of camels
- Low cost of production
- Excellent camel types (pack, riding and race)
- Good management and husbandry traditional systems
- Increasing acceptability of camel products (meat and milk) in urban areas
- A highly qualified scientific personnel
- Low rate of epidemics
2- Points of weakness
✓ Lack of breeding programs and technologies
✓ Low intensive farming
✓ Inefficient processing of products
✓ Poor veterinary and extension services in camel areas
✓ Lack of adequate sustainable research funding

3- Points of opportunities
✓ Excellent market for export
✓ Investment in processing of products
✓ Wide areas of research especially in the intensive system

4- Points of Threats
✓ Decreased pastoral areas due to increased irrational agricultural activities
✓ Episodes of intermittent draughts
✓ Camel calf mortality
✓ Uncontrolled export of live animals

THE WAY AHEAD:
In spite of the extensive research activities carried out on the camel, there are some areas that need more emphasis. More attention was given to diseases and less so to production and reproduction. For future prospects the following areas of research may be instituted:

1- More in-depth research on the etiology of camel calf diarrhea and mortality is needed. The role of the causative agents so far identified (Toxoplasma, Rotavirus and Clostridium perfringens) have to fine tuned and the relative importance of them should be precisely confirmed. Other causes such as management and nutritional factors as major or predisposing factors have to be investigated.

2- Productions parameters in the free-range or intensive systems (as in areas where agricultural and industrial byproducts are used) need to be studied.

3- Processing of camel products such as meat, milk, hides and hair are important value added commodities. Our socioeconomic studies have shown that large amounts of milk are wasted after the consumption of some milk in the pastoral areas. As for hides and hair there is limited use of them in traditional household necessities and the literature on these products is very meager or lacking. These research activities have to be coupled with studies on camel marketing.

4- Breeding studies are almost lacking. There is good potential in race camels, meat and milk types that their upgrading by selection and cross-breeding is urgent.

5- In the published work over decades, it was evident that viral and bacterial diseases are a major threat for the herd growth and productivity. It is, therefore, imperative to undertake research towards the coverage of camels by the vaccination campaigns.

6- On-farm and on-field research activities are needed in the three existing camel research centers (ELshwak, Tambol and ElRahad). The establishment of other centers in Kutum, Umshadada and the red sea will provide wider coverage of conducting research on camels in their major raising areas in the Sudan.

7- And finally what about the camel and human health:
Recent Research on various attributes of the medicinal properties of camel milk and urine is being carried out by a group of scientists in the University of Gazira. Published data indicated that camel milk and urine possess antibacterial, antifungal and antiviral activities against a wide range of infectious diseases as well as non-communicable diseases including diabetes mellitus, blood hypertension, peptic ulcer, liver cirrhosis and cancer (Ohaj et al., 2013). Recent research has also shown that camel immunoglobulins, by virtue of their smaller size and simpler structure, can be used to diagnose or combat certain human diseases such as cancer (Majid, 2011).

**Table 1: Distribution of Camel population in the Sudan**

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of Camels (Thousands)</th>
<th>Percentage to total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kordofan States</td>
<td>1200</td>
<td>36.2</td>
</tr>
<tr>
<td>Eastern States</td>
<td>1000</td>
<td>28.1</td>
</tr>
<tr>
<td>Darfur</td>
<td>736</td>
<td>15.2</td>
</tr>
<tr>
<td>Central States</td>
<td>660</td>
<td>11.00</td>
</tr>
<tr>
<td>Northern States</td>
<td>510</td>
<td>7.2</td>
</tr>
<tr>
<td>Khartoum</td>
<td>30</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Fig. (1) Camel distribution in the Sudan

REFERENCES
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Scientific Conf of Camel Research and Production (SCCRP) 17-18 April 2013, Friendship Hall, Khartoum.


