

Editorial

Dairy camels at the crossroads: emerging trends in milking, milk science, and sustainable production

The dairy camel sector is undergoing a remarkable transformation. Once confined mainly to traditional pastoral systems, camel dairying is rapidly evolving into an innovative livestock industry driven by growing demand for camel milk and due to climate change. As camels gain recognition for their ability to produce milk under harsh environmental conditions, research is increasingly focused on improving productivity while ensuring animal welfare and sustainability.

One of the most significant developments is the expansion of semi-intensive and intensive dairy camel farming. These systems provide opportunities to improve nutrition, health management, milk hygiene, and production efficiency. However, they also require management practices specifically adapted to camel biology and behaviour rather than directly adopting models developed for dairy cattle. Milking management has emerged as a major research priority. Unlike other dairy species, milk ejection in camels is closely linked to maternal stimulation and oxytocin release, making milking behaviour a key determinant of both milk yield and animal welfare. Recent studies increasingly combine behavioural observations with physiological indicators to better understand the milking process and develop welfare-oriented management practices. This knowledge is becoming essential as modern camel farms seek greater efficiency without compromising animal well-being.

At the same time, precision livestock farming is opening new perspectives for camel production. Wearable sensors, behavioural monitoring, and artificial intelligence-based decision-support systems are gradually being introduced into camel research. Although still at an early stage, these technologies hold considerable promise for improving health monitoring, reproductive management, welfare assessment, and farm efficiency.

Camel milk research has also progressed significantly. Beyond its well-known nutritional value, increasing attention is being paid to its bioactive compounds and potential applications in functional foods and nutraceuticals. Meanwhile, advances in dairy technology are supporting the development of fermented products, milk powder, and other value-added products, although processing challenges specific to camel milk remain an important area of investigation.

Looking ahead, sustainable development of the camel dairy sector will depend on integrating advances in animal welfare, precision technologies, milk quality, processing, and value-chain development. Addressing these challenges requires strong interdisciplinary collaboration among animal scientists, veterinarians, dairy technologists, engineers, economists, and industry stakeholders.

As the official publication of the International Society of Camelid Research and Development, the **Journal of Camelid Science** is uniquely positioned to support this progress by promoting high-quality research, methodological innovation, and international collaboration. We encourage researchers to contribute studies that advance our understanding of dairy camels and support the development of resilient, sustainable, and welfare-oriented production systems.

The future of camel dairying lies not only in increasing milk production but also in producing high-quality milk through management systems that respect animal welfare, embrace innovation, and contribute to sustainable food production in a changing world.

Dr Moufida Atigui

Livestock and Wildlife Laboratory, Arid Regions Institute, Medenine, Tunisia

atigui.moufida@gmail.com