



Chapter 11

Camel Colostrum Composition, Nutritional Value, and Nutraceuticals

Zeineb Jrad

 <https://orcid.org/0000-0003-0463-4353>
Arid Land Institute, Tunisia

Olfa Oussaief

 <https://orcid.org/0000-0003-3785-6083>
Arid Lands Institute of Medenine, Tunisia

Touhami Khorchani

Arid Land Institute, Tunisia

Halima El-Hatmi

Arid Land Institute, Tunisia

ABSTRACT

Colostrum is an important source of nutrients and immune factors for the newborn. The nutrient profile and immunological composition of colostrum vary from species to species. The composition and characteristics of the colostrum of human, cows, and goats have been the subject of several studies. The study of the characteristics of camel colostrum is more recent. In this chapter, the current understanding of the composition of camel colostrum (i.e., carbohydrates, proteins, oligosaccharides, fats, vitamins, and minerals) is reviewed. A complete comparison with other animal colostrum in whole composition and nutritional value of camel colostrum will be investigated in the current chapter. Consequently, the aim of this chapter is to provide an overview of the vast research, underlining the significance of camel colostrum in feeding of human beings and to predict the potential possible role of camel colostrum that can play in the functional products market in the future.

INTRODUCTION

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Data regarding camel colostrum are still limited compared to advanced camel milk. Indeed, there is only 33 references appeared between 1979 and 2019, 18 of them reported the physical and chemical composition of camel colostrum. Abu-Lehia, Al-Mohizea, and El-Beheri, (1989) conducted the first study on camel colostrum composition. Then, many works assessed the immunological quality and whey protein profile of camel colostrum. Finally, the recent references in relation with camel colostrum reported the physiological activity (Muslim, 2018; Towfik, 2018) and biological activities of camel colostrum proteins and/or their hydrolysates (Jrad et al., 2015; Jrad et al., 2019). In this chapter, the authors will investigate in depth, the physico-chemical properties of camel colostrum of both camel species (dromedary and bactrian). Then, the authors will describe in details the composition of camel colostrum, one by one (c.a. fat fraction, lactose, oligosaccharides, minerals, enzymes and whey proteins) as well as its role in human nutrition, compared to those of other animal colostrum including human, cow, goat, sheep, and buffalo. In this chapter, the authors will emphasize the biological and therapeutic values of camel colostrum.

BACKGROUND

The *Camelidae* subfamily is divided into two species: the dromedary with one-humped (*Camelus dromedarius*) and the bactrian with two-humped (*Camelus bactrianus*). The dromedary is more abundant in Africa, Middle-East and Asia than bactrian. On the other hand, the latter is mostly distributed in the arid regions of central Asia, Kazakhstan, Russia and China (FAO, 2016). This animal adapts well to the extremely harsh arid land environments (lack of water, solar radiation, high temperature, rare vegetation). Under such conditions, the camel can produce milk with\ potential health beneficial effects. In fact, recent studies indicate that camel milk contributes to the prevention and treatment of a multitude of intestinal (e.g., ulcers and inflammatory bowel) and systemic (e.g., obesity, hepatic steatosis, and diabetes) diseases that are associated with aging and nutrition. For these virtues, the use of camel milk and its products in human nutrition is gaining popularity. However, less is known about the camel colostrum use in human food products, despite been used in traditional medicine to treat edema in pregnant women and as an anti-scorbutic agent for the elderly. Camel colostrum is an “early” milk produced by milking glands of she-camel in the first five days after parturition. In subsequent two other days, it changes in mature milk (El-Hatmi, Girardet, Gaillard, Yahyaoui, & Attia, 2007). Obviously, breastfeeding of colostrum has various benefits for newly born of different species, however, the composition and nutritional value of different animal colostrum are highly varied depending on the needs of the newly born. The chemical composition of camel colostrum has been studied (Zhang et al., 2005, El-Hatmi et al., 2007, Konuspayeva et al., 2010) and there is a clear difference in the chemical composition (protein, lactose, fat, ash and total solids) of camel and other animal colostrum (cow, goat and sheep). In general, camel colostrum contains less lactose and fat, more protein, peptides, non-protein nitrogen, ash, vitamins and minerals, than other animal colostrum.

Proteins are key components of colostrum, in particular the immunoglobulins G (IgG). The IgG content must be high enough to ensure a sufficient passive immunization. In addition, consumption of a sufficient amount of colostrum is crucial to meet the high energy demand of newly born small ruminants to support their thermoregulation. In camel colostrum, immunoglobulins consist of three main sub-classes, namely IgG1, IgG2, and IgG3 (Azwai Carter, & Woldehiwet, 1996). As reported by Hamers-Casterman et al. (1993), the two immunoglobulins sub-classes –IgG2 and IgG3- are devoid of light chains and have a molecular mass of 42 and 45 kDa, respectively. This feature in the protein com-

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