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The browsing dromedary camel
II. Effect of protein and energy supplementation on milk yield

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Abstract

An on-farm experiment was conducted in Erer Valley of Eastern Ethiopia to study the effects on milk yield in lactating dromedary camels, of supplementing with a protein or energy concentrates. The treatments were control: browsing only; energy supplement (ES): browsing + ground maize (*Zea mays*) and protein supplement (PS): browsing + decorticated groundnut (*Arachis hypogaea* L.) cake. The experiment was replicated both in the dry and wet seasons. Six dromedary camels with estimated live weights of 453–473 kg were allocated randomly at peak lactation to one of three treatments in a double 3 × 3 Latin Square design. All camels were grazed during daytime hours, and camels receiving supplements were fed 4 kg of either supplement, divided in two equal morning and evening meals for a period of 63 days in both the dry and wet seasons. Milk yield differences between all treatments were significant ($P < 0.001$) with PS > ES > control, being 12.9, 9.1 and 7.6 kg for PS, ES and control, respectively. There were also differences ($P < 0.05$) between the treatments with regard to fat, with PS > control and ES, showing levels of 39, 37 and 37 g/l, respectively. Within-season variation in milk yields was similar among dietary treatments, and also highly significant ($P < 0.001$). Milk yield and fat differences between seasons were also significant, with 9.2 and 10.4 kg milk ($P < 0.001$) and 37 and 38 g/l fat ($P < 0.05$), were recorded for the dry season and wet season, respectively. There were no differences between treatments and seasons with regard to milk protein contents. Results show that oil seed by-products with relatively high crude protein value, such as groundnut cake, have a

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Abbreviations: ADF, acid detergent fiber; CP, Crude protein; DM, dry matter; EE, ether extract; ES, energy supplement; ME, metabolizable energy; NDF, neutral detergent fiber; OM, organic matter; PS, protein supplement

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substantial effect on milk production in camels. This finding is of particular importance for regions where traditional range feed resources are becoming scarce.

Keywords: Dromedary camels; Supplementation; Energy and protein; Dry and wet seasons; Milk yield; Milk composition

1. Introduction

In the arid and semi-arid areas of Ethiopia, camels are important livestock species, which contribute significantly to the livelihood of the pastoralists and agro-pastoralists living in a fragile environment. They have milk production Capability and in Pakistan, camels produced more milk per kg body weight than Sahiwal cattle, Friesian × Sahiwal cattle and buffaloes (Knoess et al., 1986). Also in a similar environment, camels produce more milk for a longer period of time than any other species, while their requirement for feed is modest (Wilson, 1998). It was reported by Knoess et al. (1986) that in Punjab (Pakistan), well-fed dromedary camels produced more milk than even high-merit exotic cattle and their crosses. They thrive in areas where green fodder is only seasonally available as a result of erratic rainfall, and can survive on feeds left by other animals (Knoess, 1977; Yagil, 1994). The efficiency of the camel should be appreciated in terms of its productivity parameter as well as with respect to its superb adaptation to a harsh environment, sustainability of production across seasons, and accessibility to people living on agronomically marginal lands.

In traditional long-range nomadic systems, the diet of camels with mixed feeding behaviour can be extraordinarily varied (Dereje and Udén, 2005). This habit limits the risk of nutritional deficiencies and the vegetation selected is also of a fairly good quality. The main range browse plants constitute an excellent forage containing up to 160 g crude protein (CP)/kg dry matter (DM) while the value of grass is only about 90 (Hashi and Cianci, 1985). The nomadic system is highly efficient and has been used by camel herders for centuries. It is, however, slowly being replaced by sedentary systems (Schillhorn Van Veen and Leoffler, 1990) due to frequent droughts, resulting in appropriation of traditional grazing lands for marginal cultivation or grazing enclosures for trade herds, and increased social unrest (Hashi, 1984; Yagil, 1994). As a result, the once desirable mixed exposure and intake to feed is being lost in the sedentary systems. In sedentary camel raising practices, a number of factors can be attributed to the low productivity observed, but feed shortage, both in quality and quantity, is probably the most important single factor.

In view of the trend to sedentary systems, there is an urgent need to investigate ways of improving the nutritional conditions of the camels in order to improve the life of pastoral societies. The assumption is that improvements may be achieved by introducing locally available supplementary feeds within available management practice without necessarily introducing new technologies. Some milk production beyond subsistence could be an incentive for improving overall camel production. In a companion paper (Dereje and Udén, 2005), we found that browsing camels selected a high CP and relatively low-digestible diet