STUDIES ON CAMELS NUTRITION

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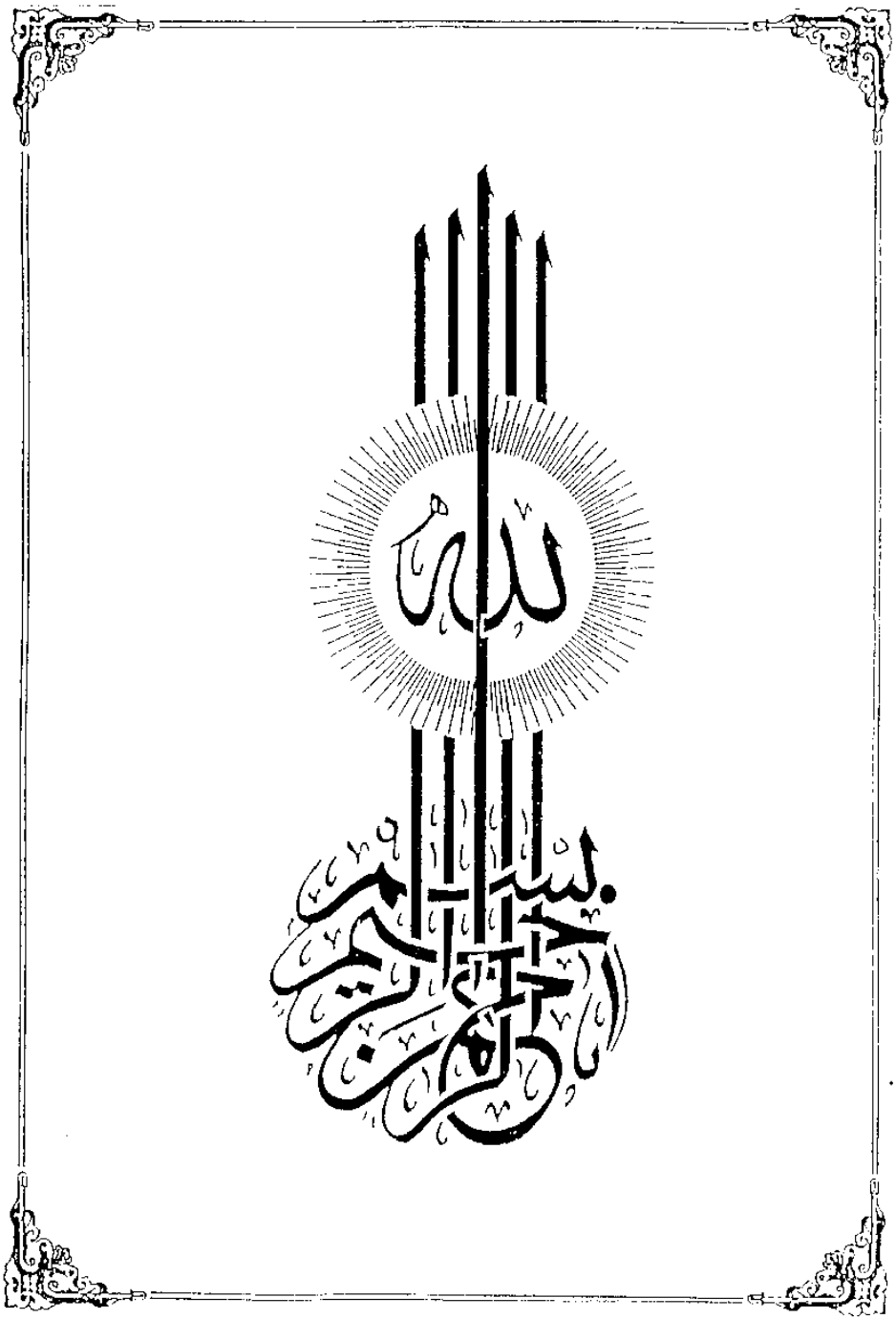

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INTRODUCTION

The FAO (1979) indicated that the world population of camels to be around 17 millions, 15.1 millions of which are one-humped camels. The estimated camel population of Egypt is about 146×10^3. Four camel breeds or ecotype are found in Egypt, the Sudani, the Maghrabi, the Fellahi and Mowalled. The Fellahi is mostly used in the Nile delta region and is not fit for desert environments, while the Mowalled is a much more suitable as farm and desert animal.

The camel is raised in the arid and semi-arid zones where feed resources are frequently scarce. It possesses remarkable abilities to exploit these limited resources (Schmidt-Nielsen, 1964). Its feed requirements are belived modest, and under drought conditions it can decrease both its food intake and metabolic rate (Knoess, 1976). Supplementary feeding is rarely practiced except for pack animals where under very poor pasture conditions animals should be given supplementary grain; chopped straw, hay or other forage and crop by-product (Leese, 1927).

The camels can survive without visiting wells and pools for long period, even when traveling, and can tolerate the loss of 30-40% of their body weight (Schmidt-Nielsen, 1964 and Gauthier-Pilters, 1974).

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Several studies have been undertaken on sheep and cattle to determine the effect of different stresses such as water deprivation and drinking saline water on their nutritional performances. Camels, on the other hand, received little attention in this respect. Therefore, although camels seem to be the best drought resistant animal and is world wide famous for its outstanding tolerance to the hardships of drought conditions, the information about camel nutrition is very scarce .Studies have been conducted at Desert Research Institute and (Farid et al. 1979) concluded that the camel is a better adapted animal to arid zone conditions than sheep. Neverthless, there are many important questions still unanswered with respect to its nutrition and management. Among these are the magnitude of tolerance of camels to water deprivation and feed starvation. Also of importance is the tolerance of camels to water salinity. These three conditions are prevailing at least seasonally in arid and semi-arid rangelands where the camels is known to survive, produce and reproduce.

Therefore, the present series of experiments were carried out at Maryot Research Station of the Desert Institute to investigate these three aspects as they relate, to animal performance, feed intake and utilization and nitrogen and mineral balances. It was hoped that the results would shed some light on the nutritional characteristics of this animal.

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REVIEW OF LITERATURE

1. The camel as a desert animal:

The camel is considered the most famed animal of the desert. Its extraordinary attributes have been appreciated by many investigators and desert experts. Still, however, there is no doubt that the camel is an exceptional and puzzling animal because, until now, there are many unanswered questions about its observed unique characteristics. Therefore, the following breif account is in order to help understand something about this famed but long-neglected animal.

The camel is raised in the arid and semi arid areas where feed resources and water are frequently scarce, and it possesses remarkable abilities to exploit these limited resources. Among other things, the special features of its digestive system have led some authors to describe it as a "pseudo" ruminant. The camel has several compartement which precede the true stomach where digestive enzymes and acid are secreted but omasum is absent. The rumen of the camels is different from that of cows. Two areas in its wall contain diverticula which are separated into smaller chambers and subchambers by separating folds of the mucosa. The edges of the chambers have strong muscular bands. This structure has been supposed to constitute a system of water storing compartements, water sacs, that the key role in the camels ability to survive the harsh arid conditions.

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However, this is not true and water conservation is achieved through other mechanisms as will be discussed latter (Schmidt-Nielsen, 1964). The rumen occupies insuch of the left side of the abdominal cavity, and in the full fed animal it may contain ingesta amounting to approximately 11-15% of the animals body weight. The extra ruminal compartement . contain numerous glands which secrete a product very similar to saliva . The small intestine are about 40 m.long and the large intestine is approximatel 19.5 m.long with a caecum similar to that of the cow except that its blind end is attached to the mesentery. Much water is observed in the large colon.

The camel is also distinct among other domestic animals by the presence of the hump, the extremely mobile lips, the long curved neck and the presence of the peculiar horny pads on the elbows (Wilson, 1984). Camels consume different kinds of forages and many types of feed are considered unsuitable for other herbivores. It could live on hard, thorny plant like Acacia and it is capable of ingesting thorn up to 1 cm.long (Matharu, 1966 and Knoess, 1976). However, camels should be allowed to feed for 6-8 hours a day, with a further 6 hours spent in rumination (Williamson and Payne, 1978). Supplementary feeding is rarely practised but under very poor pasture conditions animals should be offered supplementary grain or good quality roughages. Camels are able to consume large amount of water

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after long periods of deprivation, and they sometimes drink about one third of their body weight over a very short period (10 minutes) when a source of water is allowed. Their ability to conserve water and use it efficiently is linked with a highly efficient renal system, together with a capacity to allow for fluctuations in body temperature of up to 6°C which is considered essential for effective water conservations.

Camels grow slowly, reaching puberty at a later age than other livestock species. Sexual maturity is probably reached at 3-5 years (Matharu, 1966; khatami, 1970; Williamson and Payne, 1978 and Wilson, 1984). The length of the camels reproductive life varies, but some females continue to breed until 20 years old. Therefore the camel has a longer breeding life as compared to domestic species (Cossins, 1971 and Spencer, 1973). The calving interval as prolonged by the camels limited breeding season and by the suppression of oestrus for a long time after partiuration , in addition to the effects of the level of nutrition. Hence, camels usually calve only once every other year. The theoretical maximum annual calving rate is thus 50-80%. The oestrous period itself generally lasts 4-6 days (Joshi et al.,1978) or 1-7 days as reported by Parkes (1969); the heat is repeated every 20-25 days (average 23.4 days, Joshi, et al., 1978). Gestation period of the dromedary is often quoted as about one year, with a range of 355-389 days being given by Willamson and Payne (1978).

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The birth weight of camel calve ranges from 25.81 to 37.23 kg. prenatal losses seem to occur more frequently in the camel than in other domestic species. The new born camel is a very dilcate creature and losses are also high in the first 5 weeks of life (Williamson and Payne, 1978). Camels are potentially better milkers than many Zebu cattle breeds raised under similar harsh conditions as has been suggested by many investigators (Bremaud, 1969, Williamson and Payne, 1978 and Field, 1979 b). However, it is difficult to estimate actual milk yields under pastoral conditions because milking is irregular . Yield levels are also affected by stage of lactation, milking frequency and especially feeding and management conditions. The lactation period apparently average 12 months, and recorded yields vary from 1,134 liters under poor feeding conditions to 3,000 liters or more under good condition as has been recorded Leupold (1968), Dina and Klinteberg, (1977) and Dahl and Hjort, (1976). Camels are usually milked between once and three times a day, In terms of nutritive value camel milk compares favarably with cow and goat milk and is rich in vitamen C and minerals.

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2. Effect of Water Deprivation and Feed Starvation :

2.1. Water balances :

Water, being the principal limiting factors for the survival of all animals, it must be provided in amount to meet physiological functions of its body. The sources of water available for the animals are mainly drinking water (voluntray water intake) and from its food intake. Small amounts of water are also derived from various metabolic (oxidation) processes in the body. The many factors that influence water requirements make it difficult to recommend specific allowances. Such factors include differences between animal species, the type of diets, environmental conditions. etc.. However, sheep and cattle respond quickly to a reduced water intake, while camels, tolerate longer periods of water deprivation without adverse effects on their performance. Camels depend essentially on water contained in their food to meet their daily water requirements in the absence of sufficient water supplies. Desert pastures contain more water than is generally belived as has been reported by Gauthier-Pilters (1974) who also noted that Saharan camels may obtain 3-30 liters per day from forage plants depending on the stage of growth and locality of the vegetation. However, Schmidt-Nielson (1964) concluded that the camel could consume 30% of its body weight of water in single session after prolonged water deprivation. The Saharan camel was capable of drinking 15 litres per minute (Leupold, 1968). However Omar (1969) concluded that

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daily water consumption (liter/day) in camel was lowest in winter (12.8 liter) and highest in summer (22.2 liter). In comparison between camels and sheep, fed on all roughage diets, Shawket (1976) found that free water intake ml/day/$w^{0.82}$ were 52.6 and 90.0 for camels and sheep, respectively. The same author, also concluded that relative to dry matter intake, sheep consumed fresh water double that of camels (4.24 vs. 2.29 ml/gm DMI). Such finidings may reflect the higher water needs for sheep as compared to camels.

Camels may be deprived of water or food during extremely poor feed and water conditions or during a long period of travelling Camels in the Sahara were able to trek 1000 km., i.e. for 20-30 days without drinking water during the lush grazing season (Monod, 1955 and Mares, 1959). It has been reported that the Arabian camels drank once a week in the summer, every 7 to 10 days in the autumn and spring, and every 4 to 6 weeks in the winter (Cole, 1975) Sheep and goats as desert animals, also, posses the ability to abstain from water for sometime, but their resistance is less than that of camels Ahmed (1978) concluded that water deprivation decreased water intake by 60.11 and 49.95% in sheep and camels, respectively. On the other hand, using sheep in water deprivation studies, Clark and Quin (1949) demonstrated that sheep fed on poor quality roughage and water deprived for 72 and 96 hours reduced water consumption by 63 and 54 %, respectively. Similarly, sheep deprived of water for 72 hours were able to drink only 58% of their offered daily water intake (Abd-El Aziz, 1977). Sheep provided with water once in 72 hours drank up to one-third of

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