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## What Camels Eat: A Study in Arabic Ethnobotany

In the name of God, Most Gracious, Most Merciful  
Glorify the name of your Lord, the Most High.  
He creates and shapes.  
He designs and guides.  
He produces the pasture.  
Then turns it into light hay.  
(Qur'an, 87:1–5)

What do camels eat? The simple answer is almost anything. In the extensive lore on the camel in Arabic texts, there is a wide variety of information about the kind of plants that camels eat, what are considered the best pasture, which produce the best quality milk and some that are thought to cause harm. This study focuses on the ways in which the early Arab botanical genre classified plants for camel pasturage and the experiential information available in these texts and other lexical sources in comparison to ethnographic analysis of camel nomadism on the Arabian Peninsula. Since it is not always possible to determine the contemporary scientific designation of an Arabic plant name used over twelve centuries ago, it is important to compare the historical data with modern botanical research<sup>1</sup>. The main objective of this study is to show the potential for analysis of plants noted in the texts to be consumed or avoided by camels in Arabia. My focus is limited to *Camelus dromedarius*, the one-humped dromedary common in the Arabian Peninsula and North Africa.

Being such an important domestic animal in the Arabian Peninsula, it is not surprising that there is an extensive vocabulary for all things camel in classical Arabic.<sup>2</sup> The lexicons abound with obscure terms, some of which survive in extant dialects. Even the contemporary Arabic term for a revolution, *thawra*, also has a meaning relating to the rising up of a camel. There are a few texts devoted exclusively to the camel, including the early 9th century CE *Kitāb al-Ibl* of the pivotal linguist al-Aṣmā'ī, whose botanical text is also rich in information about camels. In general the collective term for camels is *ibl*, which can also refer to a herd of camels. The most common singular form in Arabic is *jamal*, a Semitic cognate with a long history or *ba'ūr*. The female camel is generally known as *nāqa* and the male as *fahl*, although there are many other terms depending on various descriptive aspects.

The two main botanical sources consulted for this study are both from the 9th century CE. The first is by Abū Sa'īd 'Abd al-Malik al-Aṣmā'ī (died 213 Hijra,<sup>3</sup> i.e. 828 CE), whose *Kitāb al-Nabāt* and other lexical works were widely quoted in later sources. He was one of the major Basra philologists who practiced what today would be called linguistic anthropology, resorting to Bedouins for their usages. He became quite famous, eventually serving at the court of Hārūn al-Rashīd in Baghdad. Although the surviving copies of his botanical text are not complete,

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<sup>1</sup> A table of Arabic plant names discussed in this article is available together with their contemporary scientific names at [www.ahjur.org/camelplants.html](http://www.ahjur.org/camelplants.html).

<sup>2</sup> One of the best overall introductions to the historical context of the camel in the Arab world is by Bulliet (1975), which was updated in 1990. For a general introduction to the camel, see Gauthier-Pilters and Dagg (1981), still valuable although somewhat out of date. For discussion of Arabic proverbs on camels, see Qatāmish (1988:406–419). For contemporary scientific terminology in Arabic regarding camel care and feeding, see Murād (2005:46–48).

<sup>3</sup> The Hijra designates the first year of the Islamic Calendar and refers to the emigration of Prophet Mohammed and his followers from Mecca to Medina (622 CE).

much more information is quoted in succeeding texts, including the much larger *Kitāb al-Nabāt* of Abū Ḥanīfa al-Dīnawarī, his contemporary. The text of al-Dīnawarī became the standard lexical text for plant names and is quoted frequently in the thesaurus of Ibn Sīda (1965) and the major lexicons, especially *Lisān al-‘Arab* of Ibn Manẓūr and *Tāj al-‘Arūs* of al-Zabīdī. Not all of his comprehensive analysis has survived, but parts have been edited by Bernhard Lewin (al-Dīnawarī 1974).

#### PLANT CLASSIFICATION IN ARABIA

Just as Arabic lexicons contain thousands of words related to camels, the same can be said for plants, especially those that serve as pasture. Most of the research on Arab botany has focused on medicinal plants, including the transmission of Greek commentaries such as that of the first century CE Dioscorides.<sup>4</sup> The lexical sources, as well as critical early botanical texts, document the vocabulary used by Arab Bedouin and much of this is related to pasture plants. In his unmatched thesaurus of Arabic terminology, the 11th century Ibn Sīda provides an extended discussion of words related to plants and pasturage. The sections on plants follow directly on those dealing with fertility or barrenness of land. The most important term for “fertility,” which is *khiṣb* in Arabic, is defined as a combination of sufficient pasture (*kala’*) and water (*mā’*) for the Bedouin (Abū Ḥanīfa in Ibn Sīda 1965(10):170). Fresh pasture (*al-kala’ al-raṭb*) that springs up quickly in the spring season but does not last is called *‘ushb*, which can be further defined as annual herbs. Such annuals are paired against woody perennials, defined as *shajar*. The term *shajar* has no direct counterpart in English; it can refer to trees, shrubs and bushes. The key element is that *shajar* refers to plants that have a stalk or trunk (*sāq*), paired in meaning to *najm* for a plant with no stalk (Ibn Qutayba 1982:98). A further contrast can be made between fresh (*raṭb*) plants, known as *khalā*, versus *hashīsh* for dry plants (Ibn Qutayba 1982:98).

The most common verb for grazing on pasturage is *ra‘ā*, *ri‘ya* for the act of pasturing, *rā‘ī* for the herder of camels to pasture and with *ri‘ī* and *mar‘an* for pasture or pasturage (Ibn Manẓūr gives *r-‘y* as the Arabic root;<sup>5</sup> Ibn Sīda 1965(12):11). The verb connotes caring for or protecting, as in the Arabic proverb: Do not fail to care for a young girl or pasturage, since everyone has a desire for them (*lā tada‘anna fatāt wa-lā mar‘āt fa-inn li-kull bughāt*) (al-Maydānī 1955(2):235). This term is used for domestic animals in general, i.e. *māshīya*, and not just for camels. There are several Arabic terms for pasture in general, including *ab* (Ibn Qutayba 1982:98), *sawm* (Ibn Sīda 1965(12):11), *sarḥ*, and *surūb* (Ibn Sīda 1965(12):12), as well as numerous other specific terms for the state of the pasture or how the camel grazes it. When a camel goes out at night for pasture, the term is *hayj* (Ibn Sīda 1965(12):12). As is also the case for people, feeding in the first part of the day is called *ghadā’* and at the first of the evening is *‘ashā’* (Ibn Sīda 1965(12):12). There are also terms for pasturing in certain seasons, such as *tarabbu’* for pasturing on plants in spring (*rabī’*).

Defining plants, for the Bedouin, is both a function of the availability of water and key physical characteristics of the plant itself, primarily wet or fresh vs. dry, annual vs. perennial, with a stalk or trunk or without one. Pasture can be classified according to its state, whether plentiful and thus fertile (*khiṣb*), middling (*khubba*) or dry (*jadb*) (al-Dīnawarī 1974:27). Further discrimination is directly related to plant value as pasture. This is clearly seen in the classification scheme adopted by al-Aṣma‘ī (1972:14). This model delineates several main types of plants, although disagreements have been recorded regarding which category certain plants belong to. The first is for *ahrār* plants, which are those said to be slender and soft (al-Aṣma‘ī 1972:13). He

<sup>4</sup> There are extensive resources on the botany of the Arabian Peninsula and specific countries. The basic published scientific guide is the work of Miller et al. (1996), of which six volumes are planned. See also Ghazanfar/Fisher (1998).

<sup>5</sup> As a Semitic language, Arabic words are generally formed from a root of three or four consonants. Other letters are added to form different words with the same general meaning of the root.

lists 34 specific plant names, many of which are difficult to identify over a millennium later. A second distinction, *dhukhūr*, is for 35 plants deemed to be thick and tough, with a subcategory of five plants listed neither as *dhukhūr* nor recognized as *ahrār*. The most important category of pasture, especially for camels, refers to plants known as *ḥamḍ*, of which 17 specific names are given. This is the general term for any plant with a salty (*māliḥ*) taste (al-Aṣma‘ī 1972:17, al-Dīnawārī 1974:4), thus halophytes. Ibn Manẓūr (*ḥ-m-d*) defines this as every salty (*māliḥ*) or bitter (*ḥāmiḍ*) plant, which has a stalk (*sāq*), but no bulb (*aṣl*). By contrast, *khulla* is used for plants with no salty taste (al-Aṣma‘ī 1972:17) or those considered sweet (*ḥulw*) (Ibn Manẓūr, *ḥ-m-d*).

According to al-Aṣma‘ī (1972:17), non-salty plants for the camel are like bread to a person and salty plants like meat for people, implying that both are important for a healthy diet.<sup>6</sup> He is also quoted as saying that salty plants are like *udam*, which connotes seasoned food, or fruit (al-Dīnawārī 1974:27). Non-salty plants toughen the meat (*laḥm*) and increase the fat (*tirq*) of a camel. These also enhance the natural color of the camel and make the hooves (*akhfāf*) firmer (al-Dīnawārī 1974:8, 11). On the other hand, salty plants cause the camel’s stomach to empty out and increase its body hair (*awbār*) and lead to weight loss and lack of energy. According to al-Dīnawārī (1974:8) salty plants make the meat leaner, distend the stomach, swell the hips, lengthen the hair, make camels thinner, enable them to endure thirst, make them more vulnerable and turn heads to a whitish ash cover. Yet, as noted by al-Dīnawārī (1974:7), salty plants are useful in causing the camels to drink, which keeps them from becoming emaciated.

Al-Aṣma‘ī mentions some seventeen specific *ḥamḍ* plant names, several of which continue in use on the Arabian Peninsula through to the present, well over the span of a millennium. According to Dickson (1951:416, 632) plants classified as *ḥamḍ* in contemporary Kuwait include *rimth*, *shibrām*, *ḍamrān*, *‘arād*, *‘ajrām* and *ghadrāf*. Also for Kuwait, al-Sa‘īdān (1981(1):452) lists *irtā*, *shibrām*, *rimth*, *ḥamaḍ*, *ashnān* and *ṭarfā*. Saudi varieties include, in order of benefit, *rawtha*, *rughl*, *‘arād* and *sawād* (Ṣuwāyān 2000(6):207). In Saudi Arabia these plants are said to be salty and bitter but like a “fruit” for camel (al-Quway‘ī 1984:174). *Rimth* (*Haloxyton salicornicum*) is particularly important, considered by Abū Ḥanīfa al-Dīnawārī (in Ibn Sīda 1965(11):152) to be the most beneficial halophyte plant for camels and sheep. It is also said to produce, at times, a honey-like sap in the shape of pearls.

Another important type of plant, related to its seasonal appearance, is indicated by the term *janba*, used for plants that produce leaves in seasons without rain; these are said to be intermediate between *shajar* and *nabt* (al-Aṣma‘ī (1972:17) or between *shajar* and *baql* (al-Zabīdī, *j-n-b*). These are generally smaller than *shajar* (plants with a stalk or trunk) and superior to *baql* (in reference to annual plants that spring from seed). In contemporary Saudi Arabia these *janba* plants include *rimrām*, *naqd*, *raqrūq*, *shakā‘ī* (Ṣuwāyān 2000(6):207). The *janba* plants that are grazed on after the sprouting of *buqūl* herbs are known as *khadir* (al-Maydānī 1955:8).

#### WHAT CAMELS EAT: THE DIETARY RANGE

One of the distinguishing traits of the camel is that when it is in the confines of the desert it needs no food beyond the plants which the surface of the ground offers up to it. (Jabbur 1995:207)

Unlike most other domestic animals, the camel has long been an eco-friendly consumer. When allowed to graze on their own in an arid landscape, or even when browsing on a journey, camels tend to take only a few bites out of a particular plant before moving on. “Unlike slow-moving cattle and intensively grazing goats, which crop plants down to the roots and even climb into

<sup>6</sup> This same analogy is recorded by Ibn Manẓūr (*ḥ-m-d*). It is worth noting that Gauthier-Pilters/Dagg 1981:43 conclude, “Salty plants together with dry grass, which supplies carbohydrate, form a well-balanced diet for camels.”

trees to forage,” observe Gauthier-Pilters and Dagg (1981:33), “camels are economical feeders that never overgraze the vegetation.”<sup>7</sup> Thus the camel is the ultimate “eat-and-run” or at least “eat-and-walk-on” animal. Camels also tend to spread out while grazing, which further preserves vegetation from over exploitation. It has been noted, however, that camels can damage trees from repeated selection of their foliage, especially when there is overcrowding (cf. Osman 2004:127 for Dhofar, Oman). In the United Arab Emirates, for example, the camel population has doubled in the last three decades, with consequent overgrazing due to sedentarization and construction activities (Breulmann et al. 2007:10). By 1990 it was estimated that over 30% of the grazing land in Arab Gulf states had been depleted due to larger numbers of livestock, no restrictions on grazing, and destructive gathering of wood (Batanouny 1990).

Although camels are not omnivorous, they can graze on a wide variety of plants. The list of potential species grazed on or fed to camels is quite extensive. For the North African Sahara there is a list of some 150 different plant names, only some of which are identified, in the account of Daumas (1971:103–104). Gauthier-Pilters and Dagg (1981:39) confirmed 114 principal food plants for camels in the Sahara. Basically, camels can eat almost any available herbage or leaves; thus the potential diet is unlimited. The comment by Wilfred Thesiger (2007[1959]:59) is common: “Whenever we passed any bushes we let our camels dawdle to strip mouthfuls of leaves and thorns, and whenever we came to richer grazing we halted to let them graze at will.” In many cases camels are fed what is at hand. In the southern marshes of Iraq, for example, Ochsenschlager (2004:31) observes: “They are fed on dried reed stalks and any kind of green grass or sedge that can be gathered or that grows near the water where the camel can be staked.” Even in the drought of summer, notes George March (1856:83), “the twigs, seed-vessels, and withered foliage of the desert plants supply the frugal camel with the necessary nutriment.” One of the benefits of grazing camels is that they can feed on thorny plants most other domestic animals do not touch. A camel is capable of ingesting a thorn up to 1 cm in length (Mukasa-Mugerwa 1981:27). This is due, in part, to the mobile lips and tough mucosa of the camel’s mouth. Thus, except in the depths of the desert, a herder can combine camels with sheep and goats, since the camels have a wider range of dietary choice.

A single camel in Saudi Arabia is said to need 25–35 kg of plant material a day, with a minimum of 5 kg (Şuwāyān 2000(6):208), while Gauthier-Pilters and Dagg (1981:36) observed that generally non-work camels consumed only 10–12 kg per day. The weight of a single bite ranges from 1–20 grams, depending on the plant, with between 200 and 700 bites per hour (Gauthier-Pilters and Dagg 1981:35). For the Emirates, Murād (2005:54) notes that a camel may consume 30–50 kilograms per day if there is plentiful pasture after rain, but only 20–30 kilograms if it is a dry season. In a study conducted in northern Kenya in the 1970s, observation was made of 10,000 feeding minutes and the average diet of plants for camels was made up of dwarf shrubs (48%), trees (30%), grasses (11%), other herbs (10%) and vines (1%) (Mukasa-Mugerwa 1981:36). The best grazing is said to be in spring with seasonal fresh pasturage (*‘ushb*) available on the spring rains.

There is much discussion about which plants made the best pasturage. The most comprehensive contemporary analysis is for the United Arab Emirates. For this area, Murād (2005:123–144) classified natural pasturage plants according to three types: whether the benefit is excellent, good, or middle to little value. For Arabia, Dickson (1951:409) was told that *‘arfaj* (*Rhanterium epapposum*) was “one of the finest camel foods known to the Bedawin.” It was said to be one reason that the camels from the area of al-Hasa, where this plant was abundant, were so admired. It is also considered the best grazing in the mountains and hard soil of Saudi Arabia (Şuwāyān 2000(6):207). This species is well adapted to drought and valued in large part

<sup>7</sup> This must be qualified. Even in classical Arabic there is a term for camels grazing in an area and not leaving any plants; the term is *jarz*. The term *mad‘ūka* refers to land overgrazed by camels and overexploited by people (Ibn Sīda 1965(12):21). The modern Arabic term for overgrazing is *al-ra‘ī al-ja‘iz* (Murād 2005:61).

because of its quick response to rain. It can also be consumed by camels whether fresh and green or dried. This is a dominant plant community in the northern Arabian plains stretching into Iraq (Ghazanfar/Fisher 1998:183). A recent study by Brown and Al-Mazrooel (2003) found that in depleted pasture *Rhanterium epapposum* regenerated from underground stumps that may have remained in the soil for decades.

Al-Zabīdī (‘-r-f-j) has a long entry devoted to this plant. It is a desert plant that appears quickly in summer, being soft or pliable and dust-covered, as well as having a coarse produce like *ḥasak* (the prickly head of a thistle). It has a pleasant aroma and yellow flower without any seed or thorns. Abū Ḥanīfa al-Dīnawarī was told by Bedouins that

its root is wide, occupying a [considerable] piece of ground; and it sends forth many shoots, proportionate to the root, without leaves [. . .] being only slender shoots, or at the extremities whereof are [buds, or the like, such as are termed] *zama*’, at the heads of which appears a yellow substance like hair; and [. . .] it occupies a space like that of a man sitting, becomes white when it dries up, has a yellow produce, is eaten in the fresh and dry state by the camels and sheep and goats, and its flame is intensely red (translated in Lane 1984:2017).

The significance of ‘*arfaj*’ is indicated by a proverb: *ka-mannī al-ghayth ‘alā al-‘arfaja* (Like the benefit of plentiful rain on the ‘*arfaja*). The roots of ‘*arfaj*’ are called ‘*azā’ir*’. The part of the plant that is no longer suitable for consumption is called *salīkh*. An area with a large amount of this plant is known as *ḥawmān*.

Camels are especially fond of *ḥamḍ*, the generic term for plants with a salty taste, but also used specifically for *Haloxylon articulatum* (Cav.) (Jabbur 1995:208). According to Dickson (1951:416), camels near the Euphrates, which provides a plentiful source of water, thrive on a thorny bush called camel thorn (*Alhagi maurorum*; Arabic, ‘*aqūl*’), a plant that is not liked by desert camels. Near the Iraq-Saudi border, according to Dickson (1951:611), camels will only feed on *qaysūm*, which he identifies as *Artemisia herba*, when they first leave the watering holes in autumn, but never in spring. In the Eastern Desert of Egypt it is said that camels will not eat colocynth gourd because it is too bitter (Hobbes 1989:93). Other plants that are not used for pasturage of camels in Iraq include *Alyssum homalocarpum*, *Cardaria draba*, *Carex stenophylla*, *Cutandia memphitica*, *Cynodon dactylon* and *Rumex vesicarius* (Murād 2005:145).<sup>8</sup>

Acacia trees are important browsing for camels up to 6,000 feet on the Arabian Peninsula (Great Britain Admiralty 1946:590). Acacia leaves have a high water content, which is important for desert grazing. There are many species and several important Arabic terms, which are not often consistently applied from one area to another. For Saudi Arabia there are at least 18 recorded species, for Yemen some 11 species and for Egypt about 14 species (Dubai and Al-Khulaidi (1990:44). These are widely distributed over a variety of ecozones and elevations and well adapted to drought conditions. Some species provide excellent foraging for camels, while others have unpleasant odors which may deter a grazing animal. The Arabic terms applied to Acacia trees are not consistent. The main terms are *umm ghaylān*, *daylam*, *salam*, *samur*, *sant*, *sayāl*, *ṭalh*, ‘*urfuṭ*, and *qatād*. In Egypt’s Eastern Desert, *Acacia raddiana* (*sayāl*) is used for camels and other purposes when there is no pasture from rain, but only when no other fodder is available (Hobbes 1989:105, 25). Murād (2005:141) concurs that *Acacia seyal* has less value as pasturage in the United Arab Emirates.

Camels can also browse as they travel on long trips, obviating the need to carry fodder. Marsh (1856:84) made a seven-week trek during May and June in Arabia Petraea, but only one of the camels was hand fed during the journey. Marsh complains that it was hard to keep a camel on track when it was eager to snatch foliage along the way. This can, of course, slow down traveling time, as Bertram Thomas (1929:205) discovered in the Rub‘ al-Khālī: “During the latter part of this day we made little progress, the Badawi halting at every tuft of camel thorn

<sup>8</sup> Murād (2005:145) notes that the source is a reference work on Iraq, but he apparently suggests that camels avoid these plants in the United Arab Emirates as well.

which the beasts snatched at and devoured hungrily.” On some journeys small balls of “alej”,<sup>9</sup> a mixture of millet and coarse flour the size of a man’s fist, are carried as camel feed (Great Britain Admiralty 1946:510). After a long and exhausting journey a camel may need to rest for three months (Musil 1928:359).<sup>10</sup>

Although the camel is not carnivorous, it has been known to feed other animal parts to camels. Bertram Thomas (1932:89) reports that among the Mahra of South Arabia antelope stomach was fed to camels. Gauthier-Pilters (in Gauthier-Pilters and Dagg 1981:41) observed Saharan camels eating mummified young gazelles, bones and charcoal. More commonly, especially along the southern Arabian coast, dried fish is used as camel fodder. Regarding sardines near the port of Mukalla, Pike (1940:647) notes: “The fish are taken from the nets, tossed up on the beach to dry, and then packed into large bundles for transport to the interior, where they are used for camel fodder or fertilizer.” Thomas (1929:197) also includes small herrings as fish dried for camel fodder.<sup>11</sup>

One of the major advantages of the camel is its tolerance of salt both in water and vegetation. This is due in part to its intestinal system; a camel may secrete urine that has a higher salt content than sea water (Mukasa-Mugerwa 1981:47). Salt intake is important for the camel as it facilitates passage of water in the urea and kidneys. The primary way of obtaining salt is through salty plants, such as *hamd*. If a camel does not graze on salty plants, especially during drought, for at least 15 days, it can develop bad breath, called *khulla*, like the smell of garlic (al-Ḥabartī n.d.:71).<sup>12</sup> A field study in northern Kenya noted that camel herders overwhelmingly preferred taking their camels to saline water sources (Kuria et al. 2004). The same study identified plant species with high salt content that were preferred for grazing, the top three being *Salvadora persica*, *Ficus species* and *Salsola dendroides*. It is reported that in Sudan salt is sometimes added to the camels’ water troughs (Parkyns 1850:258).

In addition to natural pasture, which will be described below, camels have been fed a variety of foods. For work camels, fodder in Saudi Arabia includes fodder grains, plant residue, cotton cakes, straw, dried clover, and alfalfa. In contemporary Saudi Arabia the best fodder mixture is said to be straw and chaff of wheat, barley and vetch with water at ratio of 10–15 kg straw to 2 kg grain (Ṣuwāyān 2000(6):206). Camels are especially fond of dates, including the pits, which may be given mixed with milk. “A dainty dish for a sick camel is dates and barley mixed with milk into a mush, and followed by Arab bread broken up into small pieces,” notes Dickson (1951:416). Local camels will eat the leaves of frankincense (*Boswellia sacra*) in the Rub’ al-Khālī, while others generally do not (Thomas 1929:206). Cottonseed cake is recommended as part of a contemporary camel diet (Murād 2005:70).

What goes in must come out. The quantity and character of camel feces, as well as urine, depends on the food consumed. When the plants are tough and woody rather than soft and moist, more fecal pellets tend to be excreted (Gauthier-Pilters 1981:61). In good pastures camels may defecate twice an hour, but only once an hour when the pasturage is poor. In classical Arabic the generic term for feces is *zibl*, but one of the more common terms encountered is *ba’r* or *ba’ar*, which is used for the camel, sheep and goat, gazelle, wild bull and, indeed, any cloven-hoofed animal.<sup>13</sup>

<sup>9</sup> This is *‘ilj*, which refers to thick round bread (*raghīf*), according to Ibn Manzūr (*‘-l-j*).

<sup>10</sup> For a detailed discussion on how the feeding of a huge number of camels in a caravan is organized see the article by Johann Heiss in this volume.

<sup>11</sup> See Dostal (1967:37, note 18 for more references on the use of dried fish along the southern coast of Yemen).

<sup>12</sup> Dickson (1951:621) notes that a desert camel must feed on one of these plants every 15 days in order to keep fit.

<sup>13</sup> For a study of the terminology of feces in Arabic and its use as fertilizer in agriculture, see Varisco 2012.

## PLANTS AND MILK PRODUCTION

The best plants for producing milk in Arabia are *sa‘dān* (*Neurada procumbens*) and *hurbuth* (al-Zabīdī), although al-Dīnawarī (1974:23) quotes al-Aṣma‘ī as saying *sa‘dān* is the best for camel milk and *hurbuth* for sheep. The plant *yanama* is said to be especially beneficial for producing milk, as it fattens the mother (al-Dīnawarī 1974:24). Al-Dīnawarī (in al-Zabīdī, ‘-r-k) also notes that *arāk* (*Salvadora persica*) is the best plant for producing a pleasant aroma in camel milk. Milk production is seasonal. Milk becomes more plentiful as they start pasturing in spring; at first both their stomachs and urine are thin but become firmer as they graze, and as they eat the seeds (*hibba*) their urine thickens (al-Dīnawarī 1974:39).

A female starts producing milk at about four to five years. This has a higher nutritive value than cow’s milk, because it is low in fat and lactose and high in potassium, iron and vitamin C. Average milk yield ranges widely, from 3.5 to 35 kg per day (Khashkhali et al. 2005:164) in Pakistan. Gauthier-Pilters and Dagg (1981:99) record daily milk production in North Africa at six liters over a 918-month period. Breulmann et al. (2007:21) suggest that under controlled dairy farm conditions a camel can yield about 20 liters per day. A unique feature is that the camel is capable of lactating even when under severe stress and still provides a high water content in the milk. According to the Rwala,<sup>14</sup> after a miscarriage a female camel can only be milked if a calf is close by (Musil 1928:333).

The taste and quality of milk is affected by the plants being foraged. In reference to Oman, Mandaville (1968) comments that camel milk often carries a trace of the local grazing plants, such as the slightly salty flavor of *rimth* (*Haloxylon salicornicum*), or the fragrance of *khuzama*. Camels that feed on mangrove (*Avicennia marina*) and *harm* (*Zygophyllaceae* sp.) produce noticeably salty milk and require water daily (Wilkinson 1977:60–61). Ibn Sīda (1965(11):153) notes that the rough plant (*dukhhūr*) called *shuqārā* or *shuqqāra* has a stench that enters the milk. In southern Algeria, flowers of the shrub *Retama raetam* give an acid taste to camel’s milk (Gauthier-Pilters 1981:45).

It is possible to subsist in the desert solely on camel milk, as has been reported about the Bedouin by several travelers (e.g. Cole 1975:42, Thomas 1931:216). The British traveler Mansfield Parkyns (1850:263) claims to have consumed only camel milk for a period of seventeen days and never felt better. Dickson (1951:416), however, warns that camel milk can be a purgative and thus “Europeans should be careful not to indulge too freely in the desert.” Milk provision is made easier by the fact that riding camels in Arabia are invariably female. Leaves of *Acacia orfota* are added to camel milk to keep it from souring (Great Britain Admiralty 1946:590).

## CAMEL ILLNESS FROM PLANTS

... gushes of liquid green excrement poured constantly  
down their hicks.  
(Thesiger 2007[1959]:165)

Not all plants are suitable for camels. Some are toxic either by their nature or in certain seasons. Others can cause health problems given other circumstances. In general it is reported that camels avoid toxic plants in pasturage areas with which they are familiar, but less so when taken to new areas (Murād 2005:146). Since camels were such an important resource for the herdsmen, it is not surprising that attention to camel health was a critical concern. One specific term for an illness that a camel or anyone catches from eating certain plants is the verb *habīṭa*, which refers to the problems from overeating, especially swelling of the stomach and inability to excrete the plant material (al-Dīnawarī 1974:18). As a result the camel can neither defecate nor urinate (al-Maydānī 1955:9). From overeating *hamḍ* the stomach is said to soften, creating a condition

<sup>14</sup> The Rawala Bedouin clan lives mainly in Saudi Arabia.

called *harr* (al-Dīnawarī 1974:18). If a camel eats *‘arfaj* and *sabaṭ*, but these do not leave the stomach, this is called *ḥabaj* and said to be similar to colic (*lawan*) in people (al-Dīnawarī 1974:18). Camels will have stomach pain from overeating *‘unzuwān* (al-Jawharī in al-Zabīdī). The dangers of excessive grazing are real; a camel can get so fat that its hump may break and cause death (Great Britain Admiralty 1946:510). Simply overfeeding a camel can lead to diarrhea, indigestion and at times even death (Mukasa-Mugerwa 1981:31). Consuming too much of a plant called *islīḥ* causes diarrhea in camels (al-Zabīdī, *s-l-h*).<sup>15</sup>

One of the earliest entries in the proverb compendium by al-Maydānī (1955(1):8) refers to the bloating (*ḥabaṭ*) of a camel’s stomach, “Like that which sprouts up in the spring and kills, or nearly so, by bloating the stomach” (in *mimmā yunbitu al-rabī‘u mā yaqtulu ḥabaṭān aw yulimmu*). The reason for this is that the first plants of spring are the thinnest and most succulent (*aḥrār al-‘ushb*). This warning is said to be part of a *ḥadīth* of Muḥammad. In his commentary al-Maydānī specifically mentions the plant name *dhuraq*, which refers to a sweet smelling plant that grows in places where water collects and stagnates (al-Zabīdī, *dh-r-q*).

If a camel grazes on *‘arfaj* and then drinks water, the *‘arfaj* will collect in a lump in the camel’s stomach and a hole needs to be cut (al-Aṣma‘ī in Haffner 1905:120, 153, Abū ‘Ubayd in Ibn Sīda 1965(7):172) Ibn Sikīt (in Ibn Sīda 1965(7):172) adds *ḍa‘a* to this and Abū Ḥanīfa includes *sabat* and says it can kill the camel. Eating the hairlike bristles (*lubda*) of *arāk* can cause a camel’s stomach to swell (Ibn Durayd in Ibn Sīda 1965(7):172). At times the important pasturage *rimth* can turn sour in the camel’s stomach and then a hole must be cut in the camel’s stomach and no more consumed (al-Aṣma‘ī in Haffner 1905:120,153, Abū ‘Ubayd in Ibn Sīda 1965(7):172). Murād (2005:58) reports that in the dry season a camel feeding too much on *rimth* may develop foul breath like garlic. If a camel feeds on a plant called *ḥayhal*, which has salty sap, this can kill it because it cannot ruminate and the plant distends the stomach (al-Dīnawarī 1974:20). According to the Rwala Bedouins, if a pregnant camel eats too much of a plant called *kurb* she can have a miscarriage (Musil 1928:333).

As reported by Beck (1991:241–242) among the Qashqai of Iran, camels that consumed the broad-leaved wild artichoke, after being starved of adequate fodder during winter, had bloated stomachs; in extreme cases the gas could rupture their stomachs and intestines and cause their death.

All the camels were emitting bad smells, had severe diarrhea, and were moaning and trying to roll on their sides. The ones less stricken stood stiffly with their back legs stretched apart [. . .] Yadollah tried to force the camels to eat a plant with anti-gas properties, and he shoved their own dung and handfuls of loose dirt into their mouths to make them vomit. The animals did not even retch.

The treatment here was first to have the camel ingest a combination of three plants with anti-gas properties, followed by kerosene down their throats and, as a last resort, puncturing their stomachs.

The seasonal state of the plant is significant. According to the almanac of Ibn al-Ajdābī (1964:155) in April (*Nīsān*) there are times when the pasture is renewed (*nashara al-kala*) after starting to dry up. This is harmful to camels, creating a disease known as *suhām*, which may be fatal. General Daumas (1971:103), writing about North Africa, expands on this:

Beginning on the fifteenth day of April the camels are no longer sent to pasture until after midday because it has been noted that before that hour the plants are covered with dew (*neda*) which would become a source of fatal maladies. Care is also taken not to allow the camels to eat in the *douars* the grass left over in the morning from the rations given the horses during the night. These precautions should be taken for a month and a half to two months, until there is no longer any dew.

An illness called *maghla* is caused by eating *baql* and dirt (al-Aṣma‘ī in Haffner 1905:152, al-Dīnawarī 1974:18, Ibn Sīda 1965(7):173); it also called *ḥaqḥa* in reference to being a stomach

<sup>15</sup> For Rwala names of camel diseases involving diarrhoea or constipation, see Musil (1928:368–369).



pain (al-Dīnawarī 1974:18, Ibn Sīda 1965(7):173). The term *ḥaṣal* refers to swallowing dirt or pebbles with a plant so that it collects in the stomach and does not emerge in the cud and can at times kill the camel, especially if in a fenced-in area (*jurḍān*) (Ibn Sīda 1965(7):173). A camel will also have trouble passing the thick dried fibrous panicle (*labid*) of a plant (al-Dīnawarī 1974:19). In North African folklore, it is said that camels will die if they eat grass on which blood has been spilled (Daumas 1971:106).

A passage in the Qur'an (88:6) refers to *ḍarī'* as pasture that neither fattens nor satiates the animals and can be dangerous for them. This is generally identified as dry *shibriq*, a thorny plant generally identified as *Ononis antiquorum*. When it is young, the thorns do not bother the camels, but they pose a problem for swallowing when they lengthen and dry. It is reported by al-Dīnawarī (in al-Zabīdī, *ḍ-r-'*) that *ḍarī'* refers to the plant in a dry state and *shibriq* in a fresh state. The people in the Hejaz called it *farā'* and claim that camels will not go near it. Others claim it is fresh *'awsaj* or even any dried up plant, especially *'arfaj*. The term *ḍarī'* is also used for a fetid plant growing in water. Ironically the same term can refer to wine or to the food of people in hell. It is said that a camel's stomach shrinks when eating coarse (*khashin*) plants, as well as during a very hot period such as *al-najr* or the intense heat of summer (*qayz*), but gains after the mid-summer rising of Canopus (Ibn Sīda 1965(12):18).

As noted by Dickson (1951:418) a disease of the lungs with much coughing is caused by eating too much "theleth," described as "a salty hamdh plant which grows in marshy country (e.g. Banāyat Araifjan and Taffat al Athami in Hazzaim region)." This is called *manhūs* and is said to be highly contagious. When camels eat a plant called *murāra*, it weakens their lips (Ibn Qutayba 1982:67). Omani camels eat a species of *Artemisia* called *ādhir*, which is considered poisonous to camels in northern Nejd (Great Britain Admiralty 1946:510). A source for the Great Britain Admiralty (1946:510) and Murād (2005:146) consider *ḥarmal* (*Rhazya stricta*) as toxic for camels. Al-Zabīdī claims that there is a plant called *ushufān*, which grows in the mountains and has leaves like colocynth and pods like cowpeas (*lūbiyā'*) and a round green seed, but is not consumed by domestic animals. Similarly a thorny plant called *umm kalb* is not used as pasture (al-Zabīdī). Gauthier-Pilters and Dagg (1981:44–46) record a number of plants toxic to camels, whether year-round, only in a certain season, or only from a certain part of the plant.

One of the most common health problems affecting camels is mange (*jarab*). This is very infectious and can even be transferred to humans. A camel contracts it from the mange mite, which burrows into the skin and causes hair loss and thickening of the skin. It generally begins in the head or neck region, but can spread to the entire body in two or three weeks. Camels may also be exposed to mange through contact with other camels or by rolling in the dust where infected camels have been. If unchecked, it will cause weight loss, reduction in milk production and possibly death. It is said that camels fatten on the thorny plant *urth*, but that this can cause mange (al-Zabīdī, *'-r-th*). In Kuwait both *'ajrām* (*Anabasis articulata*) and *shanān* (not identified) are applied to treat mange (al-Muṭayrī 1984:214).

## CAMELS AND DRINKING WATER

A thirsty she-camel murmurs pitiably, *taḥenn*, refuses to graze, her eyes overflow with tears, *tedāma'* *'ajūnaha*, every little while she makes an attempt to urinate, and her loins sink in more and more. Musil (1928:338)

Contrary to popular belief, the camel does not store water in its body or hump. In a harsh, arid environment it can lose up to one liter of water per hour through sweating (Breulmann et al. 2007:16). The camel is well adapted to drought conditions, in part because it loses very little water through its dung and urine. It can survive without water longer than any other domestic animal. While grazing on dry fodder a camel needs 3–30 liters of water a day (Ṣuwāyān 2000(6):208). This amount can be derived simply from foraging (Mukasa-Mugerwa 1981:44). The camel has a remarkable ability to replenish its water supply. In only ten minutes it can take

in a third of its body weight in water. This can range as high as 28 gallons in a single watering (Bulliet 1975:35).

Camels are noted for preferring plants with high water content in dry areas (Murād 1995:57). For Kuwait and Saudi Arabia, according to Dickson (1951:413) there is no need to provide water to camels when they are grazing in the winter. Cole (1975:46) reports that the Āl Murrah Bedouin of the Empty Quarter do not need to take their camels to wells if the winter pasture is sufficiently lush. Somali camels are reported to abstain from drinking at water sources for a month if there is good grazing (Mukasa-Mugerwa 1981:43). For the Rub‘ al-Khālī, Thomas (1931:218) observes that camels can stay away from water sources for up to two months in winter. As the weather warms they will need water about once a week, but in the very hot period the camels will need to be watered every two days. Among the Rwala Beduins, camels need water every four or five days if feeding exclusively on salty *ḥamḍ* plants, six to fifteen days if grazing on dry plants, but up to 30 days if feeding on fresh spring grasses (Musil 1928:338). During the six or seven cool months in the Sahara, camels rarely drink water apart from that obtained by browsing plants (Gauthier-Pilters/Dagg 1981:50). Dickson (1951:415) notes that providing a camel with water lessens its homing instinct. It is considered dangerous for a camel to drink water immediately after feeding, since it might drink to excess, hence the proverb: “Take to pasture, but keep from drinking water” (*ra ‘ā fa-aqṣaba*) (al-Maydānī 1955:286).

## REFERENCES

- al-Aṣma‘ī (1972): *Kitāb al-Nabāt*. (ed. ‘Abd Allāh al-Ghanaym). Cairo: Maṭba‘at al-Madanī
- Batanouny, KH (1990): “Rangeland Ecology of the Arab Gulf Countries”, in: *Proceedings of the First International Conference on Range Management in the Arabian Gulf*. London: Kegan Paul International, pp. 33–56
- (1981): *Ecology and Flora of Qatar*. Doha: University of Qatar
- Breulmann, M et al. (2007): *The Camel from Tradition to Modern Times*. Unesco: Doha Office
- Brown, G./Al-Mazrooel, S (2003): “Rapid Vegetation Regeneration in a Seriously Degraded *Rhanterium epapposum* Community in Northern Kuwait after 4 Years of Protection”, in: *Journal of Environmental Management* 68/4, pp. 387–395
- Bulliet, R W (1975): *The Camel and the Wheel*. Cambridge: Harvard University Press
- Cole, D (1975): *Nomads of the Nomads: The Āl Murrah Bedouin of the Empty Quarter*. Chicago: Aldine Publishing Company
- Daumas, EMJ (1971): *The Ways of the Desert* (trans. Ohlendorf, SM). Austin: University of Texas Press
- Dickson, HAR (1951): *The Arab of the Desert*. London: Allen & Unwin
- al-Dīnawarī (1974): *Kitāb al-Nabāt*. (ed. Lewin, B) Beirut: Dār al-Qalam
- Dostal, W (1967): *Die Beduinen in SüdArabien: Eine ethnologische Studie zur Entwicklung der Kamelhirtenkultur in Arabien*. Wiener Beiträge zur Kulturgeschichte und Linguistik, Veröffentlichungen des Instituts für Völkerkunde der Universität Wien, XVI. Vienna: Horn
- Gauthier-Pilters, H/Dagg, A (1981): *The Camel: Its Evolution, Ecology, Behavior, and Relationship to Man*. Chicago: University of Chicago Press
- Ghazanfar, SA (2004): “Biology of the Central Desert of Oman”, in: *Turkish Journal of Botany* 26, pp. 65–71
- /Fisher, M (eds.) (1998): *Vegetation of the Arabian Peninsula*. Geobotany 25. Dordrecht: Kluwer Academic Publishers
- Great Britain Admiralty (1946): *Western Arabia and the Red Sea*. B.R. 527. London: Naval Intelligence Staff, Great Britain Admiralty
- al-Ḥabartī, ‘Alī Muḥammad n.d.: al-Ibl. Khobar: Dār al-Ḥabartī li-al-Nashr wa-al-Tawzī‘
- Haffner, A (1905): *Texte zur Arabischen Lexikographie*. Leipzig: Harrassowitz
- Hobbes, JL (1989): *Bedouin Life of the Egyptian Wilderness*. Austin: University of Texas Press
- Ibn Manzūr n.d.: *Lisān al-‘Arab*. Beirut: Dār Ṣādir
- Ibn Qutayba/Abū Muḥammad ‘Abd Allāh (1982): *Adab al-kātib*. Beirut: Mu’assasat al-Risāla
- Ibn Sīda (1965): *al-Mukhaṣṣaṣ*. Beirut: Dār al-Āfāq al-Jadīda
- Jabbur, J S (1995): *The Bedouins and the Desert: Aspects of Nomadic Life in the Arab East*. Albany: State University of New York
- Khaskheli, M/Arain, MA/Chaudry, S/Soomro, AH/Qureshi, TA (2005): “Physico-Chemical Quality of Camel Milk”, in: *Journal of Agriculture & Social Sciences* 1/2, pp. 164–166. <http://www.ijabjass.org>, consulted 15 Nov., 2010
- Kuria, SG/Wanyoike, MM/Gachuiiri, CK/Wahome RG (2004): “Indigenous Camel Mineral Supplementation Knowledge and Practices on Manyatta Based Camel Herds by the Rendille Pastoralists of

- Marsabit District, Kenya”, in: *Livestock Research for Rural Development* 16/7. <http://www.lrrd.org/lrrd16/7/kuri16051.htm>, consulted 15 Nov., 2010
- Lane, E (1984): *An Arabic-English Lexicon*. Cambridge: The Islamic Texts Society. (reprint)
- Mandaville, J P (1968): “Flowers in the Sand”, in: *ARAMCO World Magazine*, January/February. <http://www.saudiaramcoworld.com/issue/196801/flowers.in.the.sand.htm>, consulted 15 Nov., 2010
- Marsh, GP (1856): *The Camel: His Organization Habits and Uses*. Boston: Gould and Lincoln
- al-Maydānī, Aḥmad ibn Muḥammad (1955): *Majma' al-amthāl*. Beirut: Dār al-Ma'rifa (reprint)
- Miller, AG/Cope, TA/Nyberg, JA (1996): *Flora of the Arabian Peninsula and Socotra*. Vol. 1. Edinburgh: Edinburgh University Press
- Mukasa-Mugerwa, E (1981): *The Camel (Camelus dromedarius): A Bibliographical Review*. Addis Ababa: International Livestock Center for Africa. [http://books.google.com/books?id=ipGBmdJy\\_5cC&lpg=PA37&ots=Q1Hlw0B5B&dq=camel%20grazing%20plants&pg=PA11#v=onepage&q=camel%20grazing%20plants&f=false](http://books.google.com/books?id=ipGBmdJy_5cC&lpg=PA37&ots=Q1Hlw0B5B&dq=camel%20grazing%20plants&pg=PA11#v=onepage&q=camel%20grazing%20plants&f=false), consulted 15 Nov., 2010
- Murād, Muṣṭafā Muḥammad (2005): *Malāmiḥ fī taghdiyā al-ibl wa-tarbīyathā*. Al-'Ayn: Markaz Zāyid li-al-Turāth wa-al-Ta'rīkh
- Musil, A (1928): *The Manners and Customs of the Rwala Bedouins*. Oriental Explorations and Studies 6. New York: American Geographical Society
- al-Muṭayrī, Muḥsin (1984): *al-Dīwān al-atharī: 'adāt wa-turāth al-bādiya, al-a'rāf wa-al-muṣṭalahāt al-qabīla*. Kuwait: Maṭābi' Dār al-Siyāsa
- Ochenschlager, EL 2004: *Iraq's Marsh Arabs in the Garden of Eden*. Philadelphia: University of Pennsylvania Museum of Archaeology and Anthropology
- Osman, AE (ed.) (2005): *Collection of Valuable Indigenous Plant Species of the Arabian Peninsula, 1998–2004*. International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria. <http://www.icarda.org/aprp/PDF/New%20PDFs/racoll/Oman2001.pdf>, consulted 15 Nov., 2010
- Parkyn, M (1850): “The Kubbabish Arabs between Dongola and Kordofani”, in: *Journal of the Royal Geographical Society of London* 20, pp. 254–275
- Pike, R (1940): “Land and Peoples of the Hadhramaut, Aden Protectorate”, in: *Geographical Review* 30/4, pp. 627–648
- Qaṭāmish, 'Abd al-Majīd (1988): *al-Amthāl al-'Arabīya: Dirāsa ta'rīkhīya taḥlīlīya*. Damascus: Dār al-Fikr
- al-Quway'ī, Muḥammad 'Abd al-'Azīz (1984): *Turāth al-ajdād*. Vol. 2. Riyadh: Maktabat al-Fārūq
- al-Sa'īdān, Ḥamad Muḥammad (1981): *al-Mawsū'a al-Kuwaytīya al-mukhtaṣara*. Kuwait. Two volumes
- Sankary, MN (1981): “Principles of the Arabian Heritage in Desert Plant Ecology and Range Plant Classification”, in: *OIKOS* 36/2, pp. 254–256
- Thesiger, W (2007 [1959]): *Arabian Sands*. London: Penguin Books
- Thomas, B (1929): “The South-Eastern Borderlands of Rub' al Khali”, in: *The Geographical Journal* 73/3, pp. 193–212
- (1931): “A Camel Journey Across the Rub' Al Khali”, in: *The Geographical Journal* 78/3, pp. 209–238
- (1932): “Anthropological Observations in South Arabia”, in: *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 62, pp. 83–103
- Varisco, DM (2012): “Zibl and Zirā'a: Coming to Terms with Manure in Arab Agriculture”, in: Jones, R (ed.): *Manure Matters: Historical, Archaeological and Ethnographic perspectives*. London: Ashgate
- Wilkinson, JC (1977): *Water and Tribal Settlement in South-East Arabia: A study of the Aflāj of Oman*. Oxford: Clarendon Press
- Yagil R (1982): “Camels and Camel Milk”, in: *FAO Animal Production and Health Paper* 26. <http://www.fao.org/DOCREP/003/X6528E/X6528E00.htm#TOC>, consulted 15 Nov., 2010

