Influence of new feeding technology of milk dromedary camels on their dairy productivity

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Abstract. The research aims to determine the influence of the new technology of feeding dromedary female camels on their dairy productivity. Milk camels of the I control group were kept in conditions of pasture with supplementary feeding of 3 kg of wheat bran, milk camels of the II experimental group, in addition to the main diet – pasture forage, received additional feeding with 3 kg of concentrated feed, consisting (wt.%) a mixture of grain waste – 50, cotton husk – 10, wheat – 25 and barley – 15 with a total nutritional value of 1.0 feed units, 9.46 megajoule of metabolizable energy and 90.5 g of digestible protein. Studies have shown that the dairy productivity of experimental groups of milk female camels gradually increases from the beginning of the lactation period. For 12 months of the lactation period, the dairy productivity of dairy camels in the control group was 2995.3 liters, in the II experimental group – 3236.2 liters in the III experimental group – 3467.9 liters. The average fat content of camel milk from sucking dromedary female camels, depending on the level of feeding, averages 4.22-4.39%.

1. Introduction

In the Republic of Kazakhstan, camel breeding mainly develops in the desert and semi-desert natural and climatic zones. In the desert zone of the Republic of Kazakhstan, the area occupied by wormwood communities is significantly broadening. On the light chestnut and brown loamy soils of the semidesert, needlegrass-sheep fescue (dominated by one or several needlegrasses), needlegrass-wormwood, fescue-needlegrass, fescue-needlegrass-wormwood plant communities are widespread. Crop capacity from 1.7 to 8.0 c/ha, depending on the conditions of the habitat and the nature of use. Along with steppe grass stands, a small area is occupied on solonetzes by wormwood and saltwort communities, which, in combination with steppe vegetation, are a typical feature of the semidesert zone [1,2]. In Kazakhstan, productive camel breeding mainly develops due to the breeding of Kazakh Bactrians [3,4]. In the Chinese southern zone, milk with a fat concentration of more than 4% (4.23-4.92%) is obtained from camels. The standard variation of camel milk in Kazakhstan and Mongolia is 3.96±0.41% in terms of protein; lactose is 4.50±0.32%; fat is 5.32±0.43%; ash is 0.83±0.10%; the total concentration of dry substances is 14.52±0.51% [5]. Milk production from Indian camels, such as Bikaneri and, Jaisalmer and Kachi, was 3.22±0.15, 2.17±0.16 and...
3.94±0.13 L/day, respectively. Camel milk has the following parameters: opaque, white color, weak sweet smell, sharp salty taste, pH value ranging from 6.2 to 6.5. The thermal effect on camel milk using high temperatures should be evaluated in further experiments to determine the therapeutic characteristics of camel milk in raw, pasteurized and sterilized milk [6]. In the conditions of the Republic of Kazakhstan, camels of the Kazakh Bactrian breed produce milk with a high fat content, and dromedaries manifest themselves as the most abundant milk [7,8]. Female camels can produce milk throughout the year against the background of compliance with breeding technologies for milk productivity, the use of effective technologies for keeping and feeding [9-12]. In addition to bactrians, dromedaries are the most valuable in the dairy industry as the most massive camel gene pool for the countries engaged in camels [13-15].

The purpose of this study is to determine the impact of a new technology in feeding dairy camels on their milk productivity.

2. Materials and methods
Experiments are presented to study the influence of free and creeping camel grazing on the farm of A. Syzdykbekov, Otrar district of the Turkestan region of the Republic of Kazakhstan. Scientific and economic experiments were carried out to increase the productive capacity using various technologies for feeding camels. The subjects were divided according to the principle of analogues into three groups of 7 animals each, taking into account age indicators, body weight and fatness. The milk camels of experimental group I were kept in pasture conditions and at the same time received 3000 g of wheat bran; dairy camels of the II experimental group to the main pasture ration received 3000 g of concentrated feed, with the following composition (in %wt.): a mixture of grain waste – 50, cotton husks – 10, wheat – 25 and barley – 15. The energy value of the concentrated feed was 1,0 feed units, 9.46 MJ of metabolizable energy and 90.5 g of digestible protein. Camels of the 3rd experimental group to the main diet received 3000 g of a mixture of feed in the form of briquettes according to recipe No. 2. To evaluate the results of the experiment, the difference between camels in live weight, age, productivity and other indicators in the groups, the difference had a small amount of fluctuation - 10-15%, and the difference between the compared groups did not exceed 5-10%.

Taking into account milk yield, fat and protein content in milk, determination of milk productivity using a Laktan-3 analyzer (SibAgroPribor, Russia, 2017) with control milking on a monthly basis. According to the Baimukanov method, the morphological and functional characteristics of the udder of camels were determined [16, 17].

The udder of the camels had a cup-shaped shape with depressions equal to 4.0-6.0 cm, had the shape of a cone at the base, the arrangement was wide and had a downward direction. The udder of the camels had a rounded shape with depressions equal to 2.0-6.0 cm, with the shape of a cone or pear at the base, the location was not wide with a downward direction. The udder had a flat shape with depressions of 2.0-4.0 cm, with a pear shape at the base, wide spacing and direction to the sides. The udder in the form of a scapula has nipples equal to 6.0 cm or more in length, the shape of a pyramid at the base, set wide and directed to the sides. The blades of the udder are well defined from base to root. Simple udder shape with teats not exceeding 2.0 cm long, pear-shaped at the base, tightly set and directed to the sides.

The fat content of milk was determined using the Master ECO Milktester apparatus (Milktester, Bulgaria, 2017). Analyzer AM-2 (SibAgroPribor, Russia, 2017) was used to analyze total protein in milk.

Using such devices as - FOSS NIRS DS2500 (FOOD, Switzerland, 2011), InfraXact, FIStar 5000, KJELTEC (FOOS, Switzerland, 2012), the composition and nutritional value of the fodder base of the farm were determined.

3. Results and discussion
The studies have shown that the milk productivity of experimental groups of dairy camels gradually increases from the beginning of the lactation period. So, the average daily milking capacity of camels
of the I, II, and III experimental groups in April 2020 years was 8.3, 8.9, and 9.5 kg, and by autumn (October, 2020) respectively, 8.8, 10.0, and 10.6 kg (table 1).

Table 1. Dairy productivity of milk dromedary camels by lactation periods, depending on the level and feeding technology.

| Month of lactation | Traits | Group 1 | Group 2 | Group 3 |
|-------------------|--------|---------|---------|---------|
|                   |        | control | experimental | experimental |
| April             | average daily milking capacity, l | 8.3 | 8.9 | 9.5 |
|                   | dairy productivity per month, l | 249 | 267 | 285 |
|                   | average fat content of camel milk,% | 4.22 | 4.31 | 4.34 |
|                   | average daily milking capacity, l | 8.5 | 9.2 | 9.9 |
| May               | dairy productivity per month, l | 263.5 | 285.2 | 306.9 |
|                   | average fat content of camel milk,% | 4.25 | 4.34 | 4.36 |
|                   | average daily milking capacity, l | 9.1 | 9.5 | 10.5 |
| June              | dairy productivity per month, l | 273 | 285 | 315 |
|                   | average fat content of camel milk,% | 4.32 | 4.42 | 4.43 |
|                   | average daily milking capacity, l | 9.1 | 9.6 | 10.8 |
| July              | dairy productivity per month, l | 282.1 | 297.6 | 334.8 |
|                   | average fat content of camel milk,% | 4.35 | 4.44 | 4.45 |
|                   | average daily milking capacity, l | 9.0 | 9.6 | 10.2 |
| August            | dairy productivity per month, l | 279 | 297.6 | 316.2 |
|                   | average fat content of camel milk,% | 4.34 | 4.42 | 4.46 |
|                   | average daily milking capacity, l | 9.3 | 9.9 | 10.6 |
| September         | dairy productivity per month, l | 279 | 297 | 318 |
|                   | average fat content of camel milk,% | 4.28 | 4.40 | 4.45 |
|                   | average daily milking capacity, l | 8.8 | 10.0 | 10.6 |
| October           | dairy productivity per month, l | 272.8 | 310 | 328.6 |
|                   | average fat content of camel milk,% | 4.32 | 4.41 | 4.44 |
|                   | average daily milking capacity, l | 8.9 | 9.5 | 9.6 |
| November          | dairy productivity per month, l | 267 | 285 | 288 |
|                   | average fat content of camel milk,% | 4.30 | 4.39 | 4.42 |
|                   | average daily milking capacity, l | 7.3 | 8.1 | 8.6 |
| December          | dairy productivity per month, l | 226.3 | 251.1 | 266.6 |
|                   | average fat content of camel milk,% | 4.24 | 4.30 | 4.33 |
|                   | average daily milking capacity, l | 6.2 | 6.9 | 7.5 |
| January           | dairy productivity per month, l | 192.2 | 213.9 | 232.5 |
|                   | average fat content of camel milk,% | 4.28 | 4.31 | 4.34 |
|                   | average daily milking capacity, l | 6.5 | 7.1 | 7.6 |
| February          | dairy productivity per month, l | 182 | 198.8 | 212.8 |
|                   | average fat content of camel milk,% | 4.29 | 4.32 | 4.35 |
|                   | average daily milking capacity, l | 7.4 | 8.0 | 8.5 |
| March             | dairy productivity per month, l | 229.4 | 248 | 263.5 |
|                   | average fat content of camel milk,% | 4.26 | 4.34 | 4.36 |
|                   | average daily milking capacity, l | 8.2 | 8.8 | 9.5 |
| Per year          | dairy productivity per month, l | 2995.3 | 3236.2 | 3467.9 |
|                   | average fat content of camel milk,% | 4.28 | 4.36 | 4.39 |
| In % relative to the control | dairy productivity per month, l | 100 | 107.3 | 115.8 |
|                   | average daily milking capacity, l | 100 | 108.04 | 115.7 |
|                   | average fat content of camel milk,% | 100 | 101.9 | 102.5 |
During the 12th month of the lactation period, the dairy productivity of milk female camels of the control group, which were in household pasture conditions with supplementary feeding of 3 kg of wheat bran was 2995.3 liters with an average daily milking capacity of 8.2 liters. From milk female camels of the II experimental group – 3236.2 liters of milk with an average daily milking capacity of 8.8 liters, and the milk yield of camels of the III experimental group was 3467.9 liters with an average daily milking capacity of 9.5 liters or was more than in the control group by an average of 472.6 liters (115.8%), and in the II experimental group – 240.9 liters (8.04%).

It was established that the average fat content of camel milk from spring (4.22%) to the summer-autumn season slightly increases (4.35%) and in general, the average fat content of milk from sucking dromedary female camels, depending on the level of feeding, averages 4.22-4.39%.

The results of the chemical analysis of pasture forage show that the nutritional value varies significantly depending on the study period. The protein content in the composition of grass stand of the agropyreta-forb-wormwood, partially shrubby type of pastures on hilly and ridge sands during all growing seasons was comparatively higher than in wormwood and saltwort, less often with sod grasses on pastures and is 8.8% in spring at natural humidity. The content of crude fiber and nitrogen-free extractive substances (NFES) in April is 6.8% and 11.8%.

In the spring season, the chemical composition of wormwood-saltwort with an admixture of sod grains of pasture forage consists of 3.6% protein, 1.0% fat, 5.2% fiber, and 16.3% NFES with a natural moisture content of 66.6% (table 2). The composition of the salsola-wormwood pastures in the spring season consists of 72.3% water, 4.3% protein, 0.7% – fat, 7.6% – fiber, 12.6% – NFES, and 2.5% – ash. The composition of the salsola-biyurgun pastures with wormwood is somewhat different from other species since at the beginning of the growing season the moisture content is less (30.5%). The protein content is 7.8%, fat 1.3%, fiber 20.0%, NFES 27.3% and ash 12.9%.

| Main types of pastures | Organic matter content,% (raw nutrients)* |
|------------------------|------------------------------------------|
|                        | water | protein | fat  | fiber | NFES | ash  |
| agropyreta-forb-wormwood, partially shrubby type of pastures on hilly and ridge sands wormwood and saltwort, less often with sod grasses pastures on brown and gray-brown soils | 68.9  | 8.8    | 2.1  | 6.8   | 11.8 | 1.6  |
| salsola-wormwood | 66.6  | 3.6    | 1.0  | 5.2   | 16.3 | 7.3  |
| salsola-biyurgun pastures with wormwood | 72.3  | 4.3    | 0.7  | 7.6   | 12.6 | 2.5  |
| | 30.5  | 7.8    | 1.3  | 20.0  | 27.3 | 12.9 |

*R=Research period: April, 2020

That is, the chemical composition and nutritional value of feed are largely determined by the botanical composition of vegetation. Data on the forage value of certain types of fodder plants are given in table 3.

One of the most widespread food plants of most ephemeral pastures is desert sedge (Karabas ran), which grows everywhere on non-saline loess soils, where it serves as the main forage for sheep in spring ephemeral pastures. The sedge has a high nutritional value, especially in the spring season. The total nutritional value of sedge during the mass vegetation period is 0.31 feed units and 54 g of digestible protein per 1 kg of natural moisture feed. At a later date, in the fruiting stage, the nutritional value of desert sedge slightly decreases and amounts to 0.30 feed units and 39 g of digestible protein. During the indicated seasons of use, the content of fiber in sedge composition increases from 58 g to 97 g, and NFES, on the contrary, decreases from 132 to 214 g/kg of feed.
Table 3. Chemical composition and nutritional value of separate (main) forage plants for camels.

| Fodder plants                  | Vegetation stage | Content in 1 kg of feed |
|--------------------------------|------------------|-------------------------|
|                                |                  | FU, kg | DP, g | Ca/P, g | CT, mg | DM/CP (g) | Fat/fiber (g) | NFES/Ash (g) |
| Camelthorn, zhantak            | beginning bud.   | 0.23   | 25    | 4.9/0.5 | 35     | 312/38    | 7/89         | 153/25       |
|                                | bud.             | 0.25   | 28    | 4.2/0.5 | 27     | 332/44    | 9/101        | 153/25       |
|                                | flowering        | 0.24   | 26    | 5.5/0.7 | 21     | 370/46    | 11/109       | 173/31       |
|                                | fructification   | 0.34   | 30    | 3.5/0.5 | 19     | 486/50    | 17/145       | 224/50       |
|                                | earing           | 0.29   | 29    | 4.8/1.3 | 41     | 350/46    | 7/97         | 176/24       |
| Cheat grass brome kelinshekboz  | fructification   | 0.21   | 35    | 3.9/1.2 | 28     | 464/48    | 6/171        | 212/27       |
| Eremopyrum, tarakboz           | earing           | 0.25   | 52    | 5.0/0.7 | 31     | 274/71    | 18/59        | 99/27        |
|                                | fructification   | 0.29   | 45    | 4.7/0.7 | 22     | 375/63    | 8/114        | 158/32       |
| Desert sedge, sholrany         | vegetation       | 0.31   | 54    | 2.5/0.7 | 65     | 293/67    | 13/58        | 132/23       |
|                                | fructification   | 0.30   | 39    | 3.7/2.0 | 37     | 437/71    | 16/97        | 214/39       |
|                                | vegetation       | 0.30   | 52    | 3.0/0.6 | 54     | 330/70    | 11/62        | 156/31       |
| Sierozemic wormwood, bozjusan   | bud.             | 0.25   | 32    | 3.2/0.5 | 25     | 414/54    | 26/133       | 168/33       |
|                                | flowering        | 0.28   | 40    | 7.0/0.7 | 21     | 566/68    | 39/240       | 187/32       |
|                                | fructification   | 0.25   | 33    | 4.4/0.4 | 18     | 550/64    | 37/214       | 199/36       |
|                                | dead-wood        | 0.29   | 32    | 6.5/0.6 | -      | 847/66    | 30/338       | 317/96       |
| Turanian wormwood, kara jusan  | bud.             | 0.24   | 26    | 9.8/1.1 | 23     | 383/43    | 23/120       | 176/21       |
|                                | flowering        | 0.25   | 36    | 7.5/1.4 | 17     | 475/61    | 22/166       | 181/45       |
|                                | fructification   | 0.33   | 40    | 6.6/1.2 | 12     | 576/68    | 38/192       | 234/44       |
|                                | vegetation       | 0.25   | 49    | 5.8/2.4 | 65     | 305/68    | 7/69/        | 121/40       |
| Ceratocarpus, ebelek           | flowering        | 0.30   | 57    | 4.7/2.1 | 60     | 382/72    | 7/117        | 144/42       |
|                                | fructification   | 0.35   | 63    | 4.5/1.7 | 32     | 568/80    | 8/204        | 220/56       |
|                                | dead-wood        | 0.36   | 41    | 6.1/2.4 | -      | 885/77    | 14/323       | 379/92       |
|                                | vegetation       | 0.20   | 26    | 9.1/0.3 | 18     | 289/40    | 4/66         | 123/56       |
|                                | flowering        | 0.12   | 21    | 8.3/0.2 | 12     | 419/39    | 10/130       | 188/52       |
| Salsola orientalis, keireuk    | fructification   | 0.18   | 27    | 7.0/0.2 | 10     | 496/50    | 9/102        | 239/96       |
|                                | dead-wood        | 0.32   | 32    | 9.5/0.4 | -      | 694/50    | 11/190       | 312/12.3     |

*FU – feed units, DP – digestible protein, CT – carotene, DM – dry matter, CP – crude protein.

Cheatgrass brome (kelinshekboz) is found on almost all non-saline soils and gray soils. In the heading phase, the nutritional value is 0.29 feed units and 29 g of digestible protein, 4.8 g/kg of calcium, and 1.3 g/kg of phosphorus, and 41 mg of carotene. As it matures, the total nutritional value of brome decreases to 0.21 feed units, it is a feed of average quality.

Eremopyrum (tarakboz) is widespread mainly on pastures with firm soils. It is well standing eaten by animals in a green and dry form and is a fattening plant.

In terms of chemical composition, especially in the phases of vegetation and budding, Eremopyrum has a high protein content (71 and 63 g/kg, respectively), fat (18 and 8 g/kg) and a relatively lower content of crude fiber (59 and 114 g/kg).

Seroziemic wormwood (bozjusan) is the most widespread fodder plant, found in the desert zone throughout plain Kazakhstan. It creates zonal indigenous communities in gypsum, clayey and loamy deserts on gray-brown and brown desert soils, as well as fixed sands.

In spring, the sierozemic wormwood protein contains all the essential amino acids in varying amounts. 1 kg of air-dry wormwood contains arginine – 6.9 g/kg, leucine and phenylalalmine...
within 5.1 g/kg, threonine, valine and lysine – 4.2 g/kg, tryptophan and methionine even less than 1.0 and 0.1 g/kg, respectively. It should be noted that methionine and tryptophan are absent in the composition of the protein of this type of wormwood.

In spring, the growing season of sierozemic wormwood from the Moyunkum massif of the northern subzone of the desert, in contrast to the previous species, contains more leucine – 6.0, lysine – 5.0 and valine – 4.8 g/kg. But in the specified season, methionine and tryptophan are absent in the protein. It is known from literature that cysteine and methionine can interconvert as a result of transamination and interamination reactions. Therefore, it can be assumed that the wormwood protein is quite complete.

The results of the amino acid analysis of the protein of Kochia show that, in comparison with wormwood, its composition in all seasons of the year contains much less almost all essential amino acids. Methionine and treptophan, which are absent at the beginning of the growing season of Kochia, are, on the contrary, contained although in small quantities (0.2 and 1.0 g/kg) in the summer season of their use.

4. Conclusion

The research has shown that with the new technology, the dairy productivity of experimental groups of milk camels gradually increases from the beginning of the lactation period.

In general, all studied samples of the main plants of desert pastures are characterized by a relatively high level of protein content and biological value of their amino acid composition at the level of the optimal sample with some dynamics depending on the species, place of growth and season of use.

In the Republic of Kazakhstan, camel breeding mainly develops in the desert and semi-desert natural and climatic zone. In the desert zone of the Republic, the area occupied by wormwood communities is significantly increasing. On the light-brown and brown loamy soils of the semidesert, feather grass – sheep's fescue (dominated by one or several feather grass), feather grass-fescue-wormwood, fescue-feather grass, fescue-feather-grass-wormwood plant communities are widespread. Productivity from 1.7 to 8.0 c/ha, depending on the conditions of the habitat and the usage pattern.

Studies have shown that the dairy productivity of experimental groups of milking camels gradually increases from the beginning of the lactation period. So, in April, the average daily milking capacity of camels of the I, II, and III experimental groups was 8.3, 8.9, and 9.5 kg, and by autumn (October), 8.8, 10.0, and 10.6 kg respectively.

For 12 months of the lactation period, the dairy productivity of camels in the control group was 2995.3 liters, in the II experimental group – 3236.2 liters in the third experimental group – 3467.9 liters. The average fat content of camel milk from lactating dromedaries averages 4.22-4.39% depending on the level of feeding.

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