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THE CHEMICAL COMPOSITION OF MILK FROM AFRIKANER COWS

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OPSOMMING: DIE CHEMIESE SAMESTELLING VAN MELK VAN AFRIKANERKOEIE

Die chemiese samestelling van melk van Afrikanerkoeie onder ekstensiewe toestande van voeding en bestuur was bepaal. Ouderdom het die inhoud van nie-kaseïn- en globulienstikstof asook fosfor en kalsium in melk statisties betekenisvol beïnvloed. Stadium van laktasie het ook 'n betekenisvolle invloed op die samestelling van melk van die koeie gehad.

SUMMARY

The chemical composition of milk of Afrikaner cows kept under ranching conditions of feeding and management were determined. The contents of non-casein and globulin nitrogen as well as phosphorus and calcium were statistically significiantly influenced by age. Stage of lactation also had a significant effect on the chemical composition of the milk of the cows.

Little information is available on the production and composition of milk of beef cattle and on factors which influence the composition. It is, however, assumed that the factors which influences production and composition of milk of dairy breeds will have similar effects in beef animals. It is expected that under certain circumstances, wider variation in the composition of milk of beef cows may occur due to more extensive conditions of feeding and management.

Investigations on the chemical composition of the milk of the indigenous Afrikaner cow have received scant attention in the past. Variations in the fat and S.N.F. contents of milk was studied by Reinecke (1931) and Reyneke & Bonsma (1964) and by Osterhoff & Pretorius (1966) on the biochemical polymorphism in milk proteins of milk of the Afrikaner cow. A more comprehensive study on the composition of milk of the Afrikaner cow and growth of her calf was conducted by Heyns (1960) which included eight constituents in the milk.

In view of the above, this experiment was initiated to determine the concentration of 15 constituents in milk of Afrikaner cows and factors influencing their variation. Cattle from the Glen Agricultural Research Institute were used for this purpose.

Procedure

The experimental group consisted of 12 Afrikaner cows of which 4 were 4 years of age, 4 were 6 to 7 years of age and 4 were more than 9 years old.

The management of the herd was essentially that of a typical ranching beef herd with no supplementary feeding and the calves were allowed to run free with their dams.

Composite milk samples of the morning and evening milking were obtained from each cow every fortnight. Seventeen milk samples were obtained from each cow at fortnightly intervals over a period of 32 weeks. The first samples were taken approximately 14 days after parturition.

The milk constituents were determined by methods described by Davies & McDonald (1953) and Ling (1956).

The data were statistically analysed by computing an analysis of variance.

Results and Discussions

Table 1 shows the composition of the milk of the 12 Afrikaner cows. The values given for each constituent in TAble 1 is the average of 204 samples of milk analysed from the beginning to the end of the lactation period. The constituents are expressed as g/100 g of milk.

The Afrikaner cows were veld animals, untrained to the halter and never milked before. The fat and total solids contents of the milk will be affected by the eventual incomplete evacuation of milk. According to Johansson (1962), the contents of protein, lactose and minerals are, however, unaffected by normal variations in the degree of udder evacuation.

The composition of the milk of Afrikaner cows in the present study can be compared with that of other beef breeds.

Information on the total solids, solids not fat and fat contents in milk of beef breeds is fairly common, but

Table 1

The composition of milk of Afrikaner cows

Total solids	:	13,155 ± 0,501
Fat	:	2,658 ± 0,103
S N F	:	10,497 ± ,997
Total nitrogen	:	0,598 ± ,076
Non-casein nitrogen	:	0,124 ± ,011
Casein nitrogen	:	0,475 ± ,064
Proteose-peptone N	:	0,029 ± ,004
Albumin nitrogen	:	0,035 ± ,006
Globulin nitrogen	:	0,026 ± ,003
N.P.N.	:	0,035 ± ,003
Lactose	:	5,741 ± ,505
Ash	:	0,880 ± ,065
P	:	0,109 ± ,004
Ca	:	0,112 ± ,006

Table 2

The composition of milk of beef cattle in the literature

Breed	Total solids	S N F	Fat	Protein N	Casein N	Lactose	Ash	Reference
Afrikaner	14,65	9,93	4,72					Reyneke (1931)
Aberdeen-Angus	13,14	9,08	4,06	0,558	0,425	4,95	0,678	Cole & Johansson (1933)
Shorthorn			3,95					Dawson, Cook & Bradford Knapp (1960)
Afrikaner	13,40	10,58	2,82	0,637		5,59	0,931	Heyns (1960)
Hereford			2,95					Gifford (1964)
A. Angus			3,48					
Shorthorn			2,96					
Afrikaner	13,07	9,40	2,67					Reyneke & Bonsma (1964)
Hereford	11,97	8,45	3,52					
A. Angus	11,31	8,64	2,68					Melton, Rigos, Nelson &
Charolais	11,73	8,85	2,87					Cartwright (1967)
Hereford	11,76	8,94	2,82					
Bonsmara	13,01	8,54	3,47					Rutledge, Robison, Ahlschwede & Legates (1971)
Brahman	14,0	8,8	5,2					A.B.B.A. (1976)

less so for the rest of the constituents. (Tables 1 and 2.) Milk sampling procedures as reported in the literature for different experimental animals, differed and in some cases the animals were stall fed.

The total solids and solids not fat contents in the milk from the Afrikaner cows in the present study were higher than for those of most beef breeds reported in the literature, whilst the fat content ranged from medium to low in comparison with those of the other beef breeds.

To illustrate the effect of age on the percentage constituents in milk of Afrikaner cows, the average percentage of constituents in the milk of each age group are shown in Table 3.

The concentration of different milk constituents varied between ages. These differences were tested for significance by an analysis of variation.

Age had a statistically highly significant ($P < 0,01$) effect on the phosphorus content in milk and a significant ($P < 0,05$) effect on non-casein, globulin

Table 3

The average composition of milk from Afrikaner cows of different age groups

Constituents g/100g	Young cows	Mature cows	Old cows
Fat	3,20 ± 0,701	3,04 ± 0,622	2,02 ± 0,610
Total Solids	13,61 ± 1,490	13,65 ± 2,219	12,34 ± 1,815
S N F	10,41 ± 1,363	10,61 ± 1,766	10,32 ± 1,548
Total nitrogen	0,599 ± 0,154	0,614 ± 0,160	0,580 ± 0,100
Non-casein nitrogen	0,125 ± 0,020	0,127 ± 0,017	0,117 ± 0,017
Casein nitrogen	0,475 ± 0,087	0,488 ± 0,116	0,463 ± 0,087
Proteose-peptone N	0,029 ± 0,010	0,026 ± 0,010	0,030 ± 0,010
Albumin nitrogen	0,036 ± 0,010	0,038 ± 0,014	0,032 ± 0,010
Globulin nitrogen	0,023 ± 0,010	0,025 ± 0,010	0,028 ± 0,014
N P N	0,034 ± 0,010	0,037 ± 0,024	0,033 ± 0,010
Lactose	5,670 ± 1,352	5,814 ± 1,794	5,734 ± 1,564
Ash	0,889 ± 0,251	0,888 ± 0,093	0,864 ± 0,068
P	0,112 ± 0,014	0,112 ± 0,014	0,103 ± 0,010
Ca	0,114 ± 0,013	0,113 ± 0,013	0,109 ± 0,010

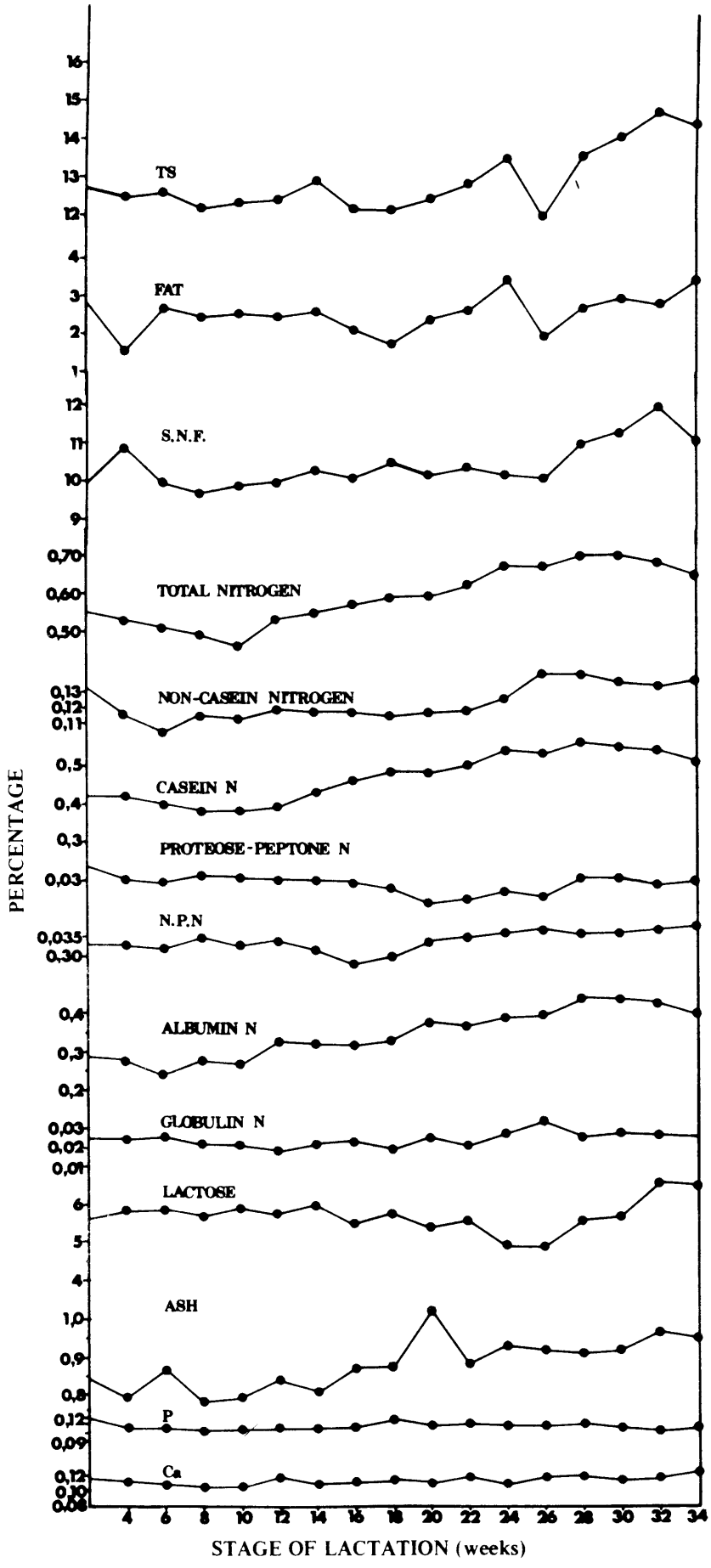

Fig. 1 *The variation of milk constituents of Afrikaner cows during various stages of lactation*

nitrogen and calcium content; the old cows having the lowest concentrations except for globulin nitrogen. The effect of age on the lower concentrations of constituents in the milk of the old cows is in agreement with a comprehensive list of research listed by Johansson & Claesson (1957), Johansson (1962) and Jennes (1974).

The effect of stage of lactation on the variation in percentage milk constituents is shown in Fig 1. The slight decrease in concentration of constituents during the first stage of lactation and the subsequent increase, follows a pattern opposite to that of a normal lactation curve. This is similar to that found in the case of dairy cows as comprehensively reveiwed by Waite, White & Robertson (1956), Smith (1959), Rook (1961) and Rook & Campling (1965).

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