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WINTERING SYSTEMS FOR COWS IN THE EASTERN HIGHVELD

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OPSOMMING: OORWINTERINGSTELSELS VIR KOEIE IN DIE OOSTELIKE HOËVELD

Sestig volwasse Frieskoeie is in ses vergelykbare groepe van 10 koeie elk verdeel. Groepe 1, 2 en 3 het gedurende die Winter, d.w.s. jaarliks vanaf 15 Mei, op spaarveld gewei en die volgende aanvullings ontvang: Groep 1 'n lek met nie-proteïen stikstof, Groep 2 dieselfde lek as Groep 1 plus mieliekuilvoer om in 50 % van die N-behoeftes van die proefdiere te voorsien. Groep 3 het dieselfde behandeling as Groep 2 ontvang behalwe dat vlugtige vetsuur soute ook by die lek gevoeg is. Groepe 4, 5 en 6 is in krale oorwinter en het voldoende mieliekuilvoer ontvang om aan die N-behoeftes vir onderhoud te voldoen. Die volgende addisionele aanvullings is verskaf: Groep 4, gewone fosfaat plus sout lek, Groep 5 'n lek bestaande uit sout, fosfaat en ureum en Groep 6 dieselfde lek as Groep 3. Groep 1 het die grootste gewigsverlies, d.i., hoogsbeduidend ($P < 0,01$) meer as Groepe 2 en 3 getoon. Groepe 2 en 3 het slegs geringe gewigsverliese getoon. Groepe 4, 5 en 6 het 'n gemiddelde gewigsverlies van 3% getoon. Vir die doeltreffende oorwintering van koeie op spaarveld is N-aanvulling 'n vereiste en addisionele aanvulling met mieliekuilvoer vanaf middel Junie verhoed verdere gewigsverlies. Die byvoeging van Vlugtige Vetsuursoute tot 'n lek het geen statisties beduidende effek op gewigshandhawing gehad nie.

SUMMARY

Sixty mature Friesland cows were divided into six comparable groups of 10. Groups 1, 2 and 3 grazed spared veld during the winter from 15 May and received the following supplements: Group 1, a lick plus NPN, Group 2 the same lick as Group 1 plus maize silage to provide 50% of their nitrogen requirements. Group 3, the same treatment as 2 except that volatile fatty acids were added to the lick. Groups 4,5 and 6 were penned over winter and received maize silage containing adequate nitrogen for maintenance. The following additional supplements were provided: Group 4, phosphate and salt lick, Group 5, a lick consisting of salt, phosphate and urea and Group 6 the same lick as Group 3. Group 1 lost most weight ($P < 0,01$ cf. 2 and 3). Groups 2 and 3 lost a minimum of weight while Groups 4,5 and 6 only lost 3% of weight. For efficient wintering of cows on spared veld, nitrogen supplementation is essential and further supplementation with silage from mid-June prevents further weight loss. The addition of volatile fatty acids had no significant beneficial effect.

In the eastern parts of the Highveld region the utilization of spared veld and other low quality roughages by gestating cows during winter is of the utmost importance for the economic production of weaner calves. An abundance of low quality roughages such as unpalatable spared veld with specific nutrient deficiencies and consequent low feed intake by animals is characteristic of the eastern Highveld. Intake is the most important single factor determining the utlity value of a feed. Eng (1965) indicates that one of the major factors which limits intake is "specific nutrient deficiencies". Favourable results i.e. maintenance of body weight, were obtained in the western parts of the Highveld with non-protein nitrogen (NPN) supplementation to spared veld (Pieterse & Lesch, 1963).However, disappointing results were obtained in the eastern Highveld with NPN supplementation to spared veld, due perhaps to less palatable grasses which mature more rapidly and which have a lower nutritive value than the grasses in the western parts (Reyneke, 1965).

The present investigation was initiated to study the influence of maize silage and volatile fatty acids (VFA) when fed as qualitative supplements in addition to NPN to cows on spared veld. The feasibility of wintering cows in pens on maize silage and different supplements was also investigated.

Procedure

Sixty mature Friesland cows were divided into six comparable groups in respect of live weight and conformation. This investigation commenced in the winter of 1967 and was repeated in 1968 and 1969 with the same animals although alotted to different groups in each season.

Groups 1, 2 and 3 grazed on spared veld from the 15th May until the middle of August annually. The veld is a *Cymbopogon – Themeda* veld transition (Acocks veld type No. 56) in a secondary successional stage in which *Eragrostis plana* with an undergrowth of *E. chloromelas* predominates (Acocks, 1953). Groups 1, 2 and 3 were supplemented as follows:

Group 1 served as control and received a lick consisting of equal parts by weight of salt, dicalcium phosphate, urea and yellow maize meal *ad lib.*

Group 2 received sufficient maize silage daily to supply 50% of the N requirements for maintenance and the same lick as Group 1. N. requirements for maintenance were calculated according to Brody (1945), i.e., 3,65 g DCP/kg $W^{0,73}$ where W = weight.

Group 3 received sufficient maize silage daily to supply 50% of the N requirements for maintenance, plus free access to a lick consisting of 23,5 % yellow maize meal, 23,5 % dicalcium phosphate 23,5 % Sastimol (volatile fatty acid sodium salts), 23,5 % urea and 5,9 % salt by weight

Table 1

Weight changes of different groups

Item		Groups					
Gestating cows		1	2	3	4	5	6
Weight change 1967	(%)	- 8,17	- 2,63	- 1,52	- 7,24	- 1,19	- 2,09
Weight change 1968	(%)	- 3,82	+ 0,88	+ 1,14	- 1,40	+ 0,40	+ 1,32
Weight change 1969	(%)	- 0,79	+ 7,62	+ 5,66	- 5,98	- 6,62	- 3,92
Mean weight change	(%)	- 4,26	1,95	1,76	- 4,87	- 2,47	- 1,56
Non-gestating cows							
Weight change 1967	(%)	-13,59	- 7,52	- 5,03	- 3,57	- 2,17	- 1,23
Weight change 1968	(%)	- 6,45	- 5,18	- 4,66	- 2,75	- 2,78	- 8,64
Weight change 1969	(%)	- 9,16	+ 2,33	+ 4,50	- 5,96	- 5,61	- 5,58
Mean weight change	(%)	- 9,73	- 3,45	- 1,73	- 4,09	- 3,52	- 5,15

LSD for P < 0,05 = 3,37
P < 0,01 = 3,58

Gestating cows
At P < 0,01 2 3 5 > 1
2 > 4

Non-gestating cows
At P < 0,01 2 > 3 4 5 6 > 1

ad lib. Groups 4, 5 and 6 were wintered in pens and received sufficient maize silage to satisfy the N requirements for maintenance. The following additional supplementation was provided *ad lib.* in lick form:

Group 4 received a lick composed of equal parts of dicalcium phosphate and salt.

Group 5 had access to a lick consisting of equal parts by weight of dicalcium phosphate, salt and urea.

Group 6 received the same lick as Group 3.

In order to eliminate any camp effects Groups 1, 2 and 3 were rotated between three camps of 7,17 ha each at weekly intervals. All experimental animals were weighed at fortnightly intervals after overnight starvation.

Results

Data on weight changes of cows during three different winter seasons are provided in Table 1.

Results in Table 1 indicate that cows in Group 1 which only had access to a NPN lick lost most weight (10%) for non-gestating cows on an average. This weight loss was highly significant ($P < 0,01$) more than that of Groups 2, 3, 4, 5 and 6. In the case of gestating cows Group 1 lost significantly ($P < 0,01$) more weight (4%) than Groups 2, 3 and 5. Some variation in weight loss occurred between different seasons. Groups 2 and 3 which were supplemented with maize silage experienced considerably smaller weight losses. Groups 4, 5 and 6 which were wintered in kraals lost 3% weight on an average. Differences in weight loss between these groups were not statistically significant.

Data on lick intakes are provided in Table 2.

The results presented in Table 2 indicate that sufficient phosphorus for maintenance i.e. 8 g P according to the N.R.C. tables (N.R.C. 1962) was ingested during most seasons. Urea intake varied between 30 g and 107 g per animal per day but the intake of most groups (50 to 60 g) complied with the generally accepted intake levels of 56 to 84 g per animal per day. The lower urea intake of Group 5 in comparison with the other groups can be ascribed to the unpalatability of the lick.

The pattern of weight changes during winter of Groups 1, 2 and 3 which grazed on spared veld is graphically illustrated in Fig. 1. In order to clarify the position of weight loss on spared veld, data on weight changes of an additional group which received a lick of dicalcium phosphate and salt only in addition to spared veld is included in Fig. 1.

From Fig. 1 it may be seen that cows in Group 1 which received a NPN lick were able to maintain their weight until the middle of June after which weight losses occurred. Cows in Group 2 which received the same lick as Group 1 plus 6,8 kg maize silage per animal per day maintained their weight throughout the winter period. Cows from Group 3 which had access to basically the same lick as Group 2 but with VFA included did not show any advantage in respect of weight gain over Group 2. It is also clearly shown in Fig. 1 that the group which had access to spared veld and a lick consisting of dicalcium phosphate plus salt without any supplemental N, showed a weight loss from the middle of May throughout winter. Weight loss was especially severe during the period 10 July to 13 August. Mean weight loss for this group over entire winter periods was 126 kg i.e. 22%.

The average dry matter yield of the spared veld over the three year period was 1528 kg per ha. Ten cows were grazed in paddocks with a size of 7,17 ha. Over the 90 day experimental periods 1096 kg of spared veld was

Table 2

Lick intake of different groups

Item	Groups					
1967	1	2	3	4	5	6
Daily P intake (g)	19,32	15,05	11,17	8,90	13,01	12,39
Daily urea intake (g)	107,63	83,78	62,19	0	72,42	69,01
1968						
Daily P intake (g)	9,64	12,80	14,46	9,92	6,80	9,36
Daily urea intake (g)	56,80	71,28	84,34	0	39,47	55,38
1969						
Daily P intake (g)	8,99	7,51	13,10	6,69	5,12	9,84
Daily urea intake (g)	52,94	44,17	77,09	0	30,14	57,86

P = Phosphorus

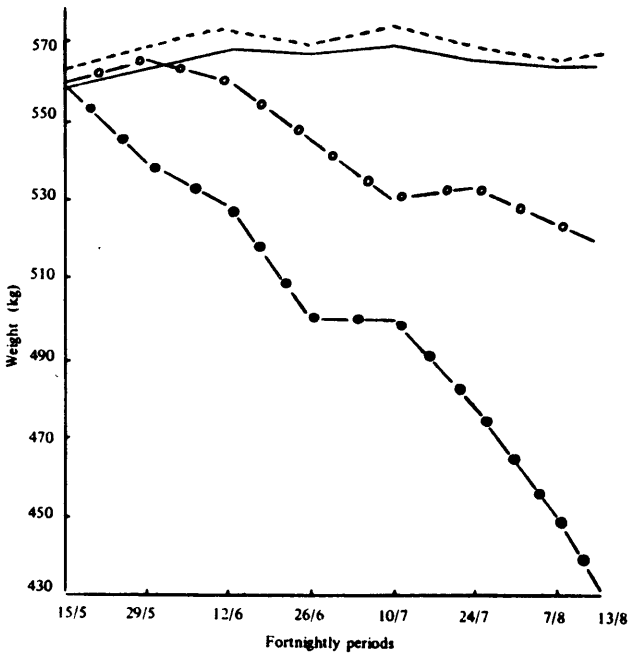

Fig. 1. — *Weight change of cows on spared veld. Group 1 (o——o), Group 2 (-----), Group 3 (——), phosphate and salt only (●——●)*

therefore available to each animal. This amounted to a calculated availability of 12,17 kg per cow per day which in fact is very close to the required intake of 14,0 kg dry matter for cows weighing 560 kg.

The composition of the veld as determined by chemical analyses is indicated in Table 3.

Data in Table 3 indicate that the average protein content of the veld over a three year period declined rapidly from May until July when it reached a very low value of 2,36%. However, the protein did not decline after July but stayed at a low level during August. The P and Ca content of the grass did not change materially during the winter months.

Table 3

Chemical analyses of veld samples

Month	Constituents				
	N	Protein	P	Ca	Fibre
	%	%	%	%	%
May	0,701	4,38	0,06	0,22	31,58
June	0,560	3,50	0,05	0,22	31,80
July	0,377	2,36	0,05	0,20	32,49
August	0,377	2,36	0,05	0,20	32,08

Discussion

Results in the present study indicate that weight losses of 22% may be expected from cows on spared veld without any supplemental N. It was also shown that when cows on spared veld were only given supplemental N in the form of a urea-energy lick, weight losses were prevented to a certain extent, but live weight maintenance could not be achieved. Since the experimental cows were receiving spared veld with a low protein content, this response to the NPN supplement was expected. This result is not altogether in agreement with that obtained by Pieterse & Lesch (1963) in the western parts of the Highveld. They achieved maintenance on spared veld when animals had access to a similar NPN lick as was supplied in the present study. Lesch, von La Chevallerie & van Schalkwyk (1969) achieved live weight maintenance with Afrikaner cows on spared veld without any supplementary N. These conflicting results may be ascribed to the difference in nutritive value of grasses peculiar to the eastern Highveld

as opposed to those grasses which predominate in the western parts.

Differences in weight losses between Groups 1, 2 and 3 indicated the beneficial effect of supplementing cows on spared veld with 6,8 kg of maize silage. Over the three year experimental period Groups 2 and 3 showed an average weight loss of 0,36% whereas Group 1 showed an average weight loss of some 7 %.

In the present investigation the addition of VFA to NPN licks did not produce any significant effect in reducing weight loss of either the groups on spared veld or those fed in the kraal on maize silage. These results are in contrast with the favourable response, in respect of reduction in weight loss which was obtained by Bishop, Grobler & Smith (1969). An explanation for this disparity might be that a possible influence of the VFA in the case of Group 3 was completely masked by the feeding of 6,8 kg maize silage.

Considering the low protein content of the natural pasture, (2,36% during July and August) and the established relationship between crude protein in the feed and digestible protein (Van Niekerk, Smith & Oosthuysen, 1967) it is obvious that some supplemental N during winter is essential. Cows on spared veld without maize silage supplementation but with supplemental N were able to maintain their weight until mid June. The relationship between onset of weight loss and protein content of the pasture is further illuminated when the data in Table 3 are considered.

Groups 4, 5 and 6 which were wintered in pens on maize silage as the only source of roughage reacted well to the treatments. Feed allowance was calculated according to the allowances of maintenance of Brody (1945) i.e. 3,65 g digestible crude protein/kg $W^{0,73}$ where W = body weight. According to this calculation an animal weighing 545,4 kg was allowed 363 g DCP and 3,502 kg TDN per day by feeding 27 kg maize silage with a moisture content of 80,5%. Whenever the moisture content of the silage varied the appropriate adaptations were made. Consequently cows received as little as 16 kg of maize silage when the moisture content dropped to 67%. In spite of the fact that animals in Groups 4, 5 and 6 did not maintain their weight to the same extent as Groups 2 and 3, weight losses were negligible and statistically non significant.

In conclusion it is advocated that in the eastern parts of the Highveld region the provision of supplemental N to animals being kept on spared veld is essential. Due to the fact that animals, when kept on spared veld, utilize the most palatable grass species first, it is suggested that additional supplementation in the form of maize silage should be provided from the middle of June. It is also advocated that the wintering of cows in kraals on a ration of maize silage as the only source of roughage can be regarded as a feasible practice and holds promise where animals have to be removed from veld during certain critical stages of veld reclamation.

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