

CONTINUOUS STALL FEEDING OF PINEAPPLE SILAGE AS THE ONLY SOURCE OF ROUGHAGE TO DAIRY CATTLE

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OPSOMMING: VOLGFHOUE PYNAPPELKUILVOER VOEDING AS DIE ENIGSTE BRON VAN RUVOER AAN MELKBEESTE

Melkbeeste het oor 'n uitgestrekte periode kuilvoer, gemaak van pynappelplante, as hul enigste bron van ruvoer ontvang. Resultate toon dat daar 'n afname in melkopbrengs en liggaamsmassa was en dat abnormaliteite van rowwe haarkleed en pika ontwikkel het. Die aanvulling van vitamine A of addisionele kragvoer het geen korrektiewe invloed gehad nie terwyl die daaglikse aanvulling van 2,7 kg lusernhooi produksie verbeter en die afwykings reggestel het. Dit word beskou dat hierdie probleme nie spesifiek deur pynappelkuilvoer veroorsaak is nie maar eerder deur die effek van langdurige kuilvoervoeding as die enigste bron van ruvoer.

SUMMARY:

Dairy animals received silage made from pineapple plants as their only source of roughage for a prolonged period. Results indicated that this reduced both milk yield and live mass and resulted in abnormalities such as rough hair coat and pica. The supplementation of vitamin A or additional concentrates had no corrective effect whereas the daily supplementation of 2,7 kg lucerne hay improved production and corrected abnormalities. These problems were not considered to be specific to the pineapple silage *per se* but rather to the effect of prolonged silage feeding as the only form of roughage.

Previous results have shown that pineapple plant material can be used effectively as silage for cattle (Henke, Willett & Maruyama, 1945; Bishop, Gradwell, Nell & Bradfield, 1965; Bishop, van Niekerk, Nell & Smith, 1967). This silage is cheap, being a waste product from old pineries. In recent years the use of this silage has increased considerably in the coastal pineapple producing regions of the Eastern Cape. However, to date there is no information on the effect of long term feeding of pineapple silage as the only source of roughage to dairy animals.

Procedure

Silage was made from pineapple plant material and fed to Jersey cows of different age groups for a period which covered two lactations and the intervening dry period. Each group consisted of five animals selected from a herd of 40 cows. Animals were introduced into the experiment as they calved down, a period of 6 months being required before group numbers were complete. Group feeding of silage was carried out.

The total diet of the cows consisted of pineapple silage *ad lib.*, concentrates (15% C.P.) fed at the rate of 1,81 kg per 4,5 kg milk produced, and a phosphate, salt and trace element lick. Dry period feeding consisted of pineapple silage *ad lib.* and a daily ration of 0,9 to 1,9 kg concentrates per cow supplied one to two months prior to calving. Five heifer calves were also reared using pineapple silage as the main source of roughage. During their first lactation these heifers were subjected to the same treatment as the experimental cows. Accumulated performance data of the Jersey herd on the Research Station were used as a basis for evaluation of results obtained. Student's *t* test was used to analyse the results.

Results

Proximate analysis of a sample of pineapple silage used was: dry material 22,8%, crude protein 1,3%, fat

0,4%; fibre 4,9%, NFE 13,9%, ash 2,3%, calcium 0,13% and phosphorus 0,04%. In a digestion trial with sheep it was found that pineapple silage was both low in TDN (11,1%) and DP (0,27%) (Wilke, Bishop & Nell, 1971).

The average daily silage intake of lactating and dry cows was 26,3 and 27,6 kg respectively. Daily silage intake varied considerably with lactating cows tending to consume slightly less silage as the experiment progressed. On the other hand, during the first and second 18 months of the experiment, dry cows had an average daily silage consumption of 26,1 and 31,2 kg respectively. The average feed intake per cow per lactation was 1453 kg concentrates and 7884 kg silage.

Production from the first and second lactations was relatively good with cows producing more milk than the herd averages for the respective age groups. On the other hand, cows on the experimental treatments produced less milk in their second than in their first lactations. Although non-significant, this tendency is contrary to the expected production trend of the young cows which should have produced more milk as they approached maturity. The first lactations of the heifer calves which were reared on the experimental treatment were considerably lower ($P < 0.01$) than the herd average for this group. Details of fat-corrected-milk (FCM) 300-day lactations are given in Table 1.

The growth rate of heifers was satisfactory with an average live mass of 267 kg at 21 months of age. This is virtually the same as the herd average and is greater than the live mass of 244 kg for registered Jersey females in South Africa (Naude & Massmann, 1965). The average live mass of all groups of cows at the outset of the experiment was slightly greater than herd averages for the respective age groups. However, by the end of the first lactation in the experiment, with the exception of the mature group, the experimental cows had lost almost significantly more live mass during lactation than herd averages. (Table 2).

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Table 1

Fat corrected milk (FCM) production per cow per lactation

Age group	FCM in kg			
	1st lactation in experiment	Herd average for age group	2nd lactation in experiment	Herd average for age group
Heifer calves	2160	3362	—	—
1st calvers	3655	3461	3569	3505
2nd calvers	4112	3230	3830	3336
Mature cows	4488	3908	3976	3908

Table 2

Differences between live mass of cows prior to calving and at the end of the first lactation

Age group	Experimental cows kg	Herd averages kg
Heifer calves	— 45,0	+ 8,6
1st calvers	— 37,4	— 7,7
2nd calvers	— 37,4	— 7,2
Mature cows	— 6,3	— 23,0
Average	— 31,5	— 11,7

During the second lactation on the experiment live mass tended to stabilise at a lower level. The overall average live mass loss during the entire two-lactation period did, however, remain higher for the experimental groups than for the herd averages (27,6 cf. 9,3 kg).

Calves born to cows after the second lactation on the experiment were significantly lighter ($P < 0,05$) at birth than the average birth mass of calves in the herd. This difference for both bull and heifer calves was 1,53 kg.

Due to an outbreak of *vibrio foetus*, breeding performance of both the experimental and herd animals was adversely affected. Breeding performance indicated however, that there were no marked differences due to treatment. The inter-calving period in days and number of days to first observed oestrus after calving were 387; 408 and 26,8; 30,1 for the experimental group and herd average respectively. The average number of services per conception for both groups was 2,5.

In addition to reduced milk yield in the second lactation and live mass loss, all cows developed pica and coat abnormalities. Pica consisted of geophagia, eating the bark off timber and drinking urine. Three of the cows also started drinking milk from the other cows and nose plates had to be fitted to prevent this. Coat abnormalities were observed in the form of rough and coarse hair which appeared to grow counter to normal hair pattern. This was most marked during the first lactation of heifer calves which

were both reared and then milked on the pineapple silage ration.

Attempts were made to correct the abnormalities that developed. During the course of the experiment prolonged vitamin A supplementation resulted in no noticeable improvement. After the experiment had been terminated, two groups of five cows each continued to receive the experimental treatment. One group received additional supplementation of 1,81 kg concentrates per cow per day. This treatment resulted in no improvement in milk production nor did it correct abnormalities. Production in fact declined markedly with an average reduction of 915 kg FCM milk from the previous lactation. The cows in the other group each received a daily supplementation of 2,7 kg unmilled lucern hay which provided approximately the same quantity of energy and protein as the 1,81 kg of concentrates. This produced a marked improvement in milk production ($P < 0,01$) and corrected those abnormalities which had developed.

Discussion and Conclusions

The problems encountered in the long term feeding of pineapple silage as the only source of roughage were at first considered to be due to some or other nutritional deficiency specific to the pineapple plant. Results from the post-experimental trial suggest that the problems were neither due to a deficiency of energy nor of protein. More recent information on the effects of prolonged feeding of silage as the only source of roughage in America (Noller & Rhykerd, 1969; Longo, 1970; Owen, 1970) show that similar abnormalities can be expected from maize. After good first lactation records, abnormalities such as emaciation, rough hair coat, decline in milk production, a craving for dirt and higher cow losses also occurred. These abnormalities were considered to be related to long term use of an all-silage forage involving slow depletion of minerals or other changes in the animal body.

The feeding of lucerne hay during lactation or the use of some or other kind of roughage or pasture during the dry period was found to eliminate the problems encountered (Noller & Rhykerd, 1969). It was concluded that until more precise knowledge of the imbalances or deficiencies was available the long term use

of corn silage as the only roughage involved some risk.

It is concluded, therefore, that the problems encountered in this study were not specifically due to the pineapple silage but rather to the effect of the prolonged feeding of silage as the only source of roughage.

In spite of the problems associated with long term use of pineapple silage it is further concluded that this silage can be effectively and economically used for the continuous feeding of dairy animals. Until specific defi-

ciencies have been determined, problems can be easily avoided by feeding small amounts of lucerne hay. Available information also suggests that no problems need arise if other feeds are utilised, during periods between lactations or while animals are still growing, such as natural veld.

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