INFLUENCE OF MILK PRODUCTION ON HEALTH AND REPRODUCTIVE PERFORMANCE OF DAIRY CATTLE IN A SELECTED AREA OF TANZANIA.

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SUMMARY

This study evaluated the influence of milk productivity on health and fertility of dairy cattle raised in Morogoro, Tanzania. It compared disease incidence, culling rates and fertility indices in three production groups of dairy cows. Group I comprised of 30 cows producing over 500 kg of milk in the first 30 days of lactation. Group II was formed by 64 cows producing 300 – 500 kg of milk and Group III was represented by 56 cows producing less than 300 kg of milk. Diseases included in this study were mastitis, metritis, laminitis, anaplasmosis and trypanosomiasis. Highest disease incidence rates were recorded in Group I, followed by Group II. Group III registered the lowest disease incidence rates. Differences between the groups were significant ($p<0.105$). Culling rates due to health problems were 40%, 9.4% and 7.1% for groups, I, II and III, respectively.

Calving to first service (Mean ± SEM) for groups, I, II and III were 97 ± 11, 99 ± 5 and 122 ± 10 days, respectively. Corresponding calving to conception periods were 111 ± 12, 131 ± 6 and 156 ± 14 days and calving intervals were 386 ± 13, 416 ± 8 and 433 ± 13 days for groups I, II, and III, respectively. Correlations between milk produced in the first 30 days of lactation and days to first service as well as calving to conception period were significant ($p<0.05$; $r=-0.23$ and -0.22, respectively). Correlation between 30 day milk yield and number of services per conception was, however, not significant ($r=-0.15$; $p> 0.05$).

In general high milk producing cows tended to have better fertility although they were more susceptible to diseases. It was therefore, concluded that the potential for high milk yield and fertility in dairy cows can be realized if herd health management is intensified.

INTRODUCTION

Optimizing efficiency of milk and calf production is a necessary goal in any dairy enterprise. This goal is, however, seldom fully achieved because many factors associated with these two products are not so well understood that they can be easily controlled (Esslemont, 1982). Health problems constitute one group of such factors. Associations of individual health problems such as mastitis, metabolic disorders and fertility problems with milk production have been investigated in many countries outside East Africa (Louca and Legates, 1968; Wilton et al., 1972; Olds et al., 1979; Erb et al., 1981; Thompson et al., 1984). Very few studies have however, been carried out to associate production with

susceptibility to disease as well as elucidate reciprocal relationships between milk yield and health problems (Erb et al., 1985; Bigrass-Poulin et al., 1990). Relationships between health and production in dairy cattle may be bi-directional. That is level of milk production may alter the risk of disease which may in turn affect milk production (Dohoo and Martin, 1984). Assessment of these relationships is however complicated; problems of health and production usually occur within the same period making it difficult to evaluate cause-effect relationships (Olds et al., 1979). This difficulty, can however, be overcome by epidemiologically relating milk production during a certain defined period to health problems occurring after this time (Martin et al., 1987; Markusfeld, 1990).

This study evaluated the influence of level of milk yield in the first 30 days of lactation in normal dairy cows on subsequent incidence of health problems and on reproductive performance. The measure of the frequency and degree with which milk production is influenced by disease is called the "impact of health problems". The impact of health problems on milk production was also investigated by this study in order to assess the relevancy of dairy herd health management.

MATERIALS AND METHODS

Location

This study was conducted at Morogoro in a dairy herd belonging to Sokoine University of Agriculture (SUA). Morogoro is situated at an altitude of about 520 m above sea level. It receives more than 800 mm of rain per year. Temperatures are relatively constant throughout the year, ranging from 27°C to 31°C at day time and not less than 14°C at night during the coolest months.

Animals

Animals comprised of Tanzania adapted *Bos taurus* breeds mainly Friesian and Ayrshire cows. These cows were grazed during the morning and evening hours when environmental temperatures were low, and zero grazed in the afternoon when temperatures where high. At night they were kept in loose house or paddocks where they were offered green chop or silage. In addition, the cows were supplemented with concentrates during milking. Milking was done between 06.00 and 7.00 a.m. and from 4.00 to 5.00 p.m.. Animals received regular veterinary care which included vaccinations against anthrax, black quarter, haemorrhagic septicaemia, foot and mouth disease and lumpy skin disease. Acaricide spraying for tick control and chemoprophylaxis against trypanosomiasis were also routinely done.

Retrospective data.

Data on production, breeding and health covering 150 second and third lactations, that occurred between 1984 and 1990, was collected from farm records. This data was supplemented by information from the University Veterinary Clinic which usually handles health matters in the farm. The records provided information on milk yield, incidence of common diseases namely mastitis, metritis, laminitis, anaplasmosis and trypanosomiasis as well as culling rates. In addition, fertility indices namely calving to conception period, number of services per conception and interval between calvings were calculated.

In order to find out the influence of production on disease incidence,

animals were divided into three groups according to level of milk production during the first 30 days of lactation. All breeds were equally represented in each group. Milk yield in the first 30 days of lactation is considered to be the yield which reflects the animals intrinsic capacity to produce milk provided this is not confounded by disease occurrence (Olds et al., 1979). Only animals remaining healthy for at least 30 days after calving were included in the analysis. Group I was the high yielding group, formed by 30 cows producing over 500 kg, Group II was the medium yielding group, comprising of 64 cows producing 300 – 500 kg and Group III was the group of low yielders represented by 56 cows producing less than 300 kg. Disease incidences and fertility indices recorded within lactation in each group were compared.

For purposes of determining the impact of common health problems namely mastitis, metritis and laminitis on production and reproductive performance, 32 cows with the mentioned health problems were matched with normal herd mates. A diseased cow would be matched to a herd mate of the same breed, age, parity and lactation number. Matching was to reduce the influence of factors such as breed which would otherwise be associated with susceptibility to disease. With the herd mates serving as controls, production parameters and fertility indices of the resulting pairs were then compared.

Statistical analysis

Chi-square was used to test the significance of differences in incidence rates between the groups;where as Duncans multiple range test was used to test significance of differences in milk production and fertility indices. In addition, correlation analysis between lactation performance and fertility indices was done according to Snedecor and Cochran (1980).

RESULTS

Diseases incidence rates in different production groups are summarized in Table, 1. Of the three groups, highest disease incidence rates were recorded in group I, the high yielding group, followed by medium yielding group which was Group II. Group III (Low yielders) registered lowest incidences; differences between groups being significant ($P<0.05$). The high disease incidence rates were also associated with high culling rates. The culling rates in Groups I, II and III were respectively 40%, 9.4% and 7.1%.

Results of investigations on influence of milk production on reproductive performance are summarized in Tables 2a and 2b. High yielding group had best fertility indices; followed by medium yielders. Low producers had comparatively the poorest indices. Correlation analysis (with n = 128 revealed negative and signifant correlation between 30 day milk yield and calving to first service and calving to conception periods ($r = -0.23$ and -0.24 respectively; $P<0.05$). Lactation yield was similarly negatively correlated with the period from calving to first service, number of services per conception and calving to conception period ($r = -0.22$, -0.26 and -0.32; $p=>0.01$). Correlation between 30 day milk yield and services per conception was however not significant ($r=-0.15$; $P>0.05$). Table 3 shows milk production parameters and fertility indices of problems cows as well as controls. Problem cows had lower lactation yield and shorter lactation length by 642 kg and 27 days respectively. Furthermore, days to first service and calving to conception period were increased by 18 and 52 days

Table 1: Influence of milk yield during the initial 30 days of lactation on incidence of health problems.

Group (n)	DISEASE INCIDENCE RATES(%)				
	Mastits	Metritis	Laminitis	Anapla-smosis	Trypano-somiasis
High (30)	33.3	10.0	13.3	13.3	20.0
Medium (64)	12.5	15.6	6.2	9.4	12.5
Low(56)	8.9	7.1	3.6	3.6	7.1
Overall (150)	6.0	9.3	5.3	9.3	12.0

NB: (n)=number of observations; Group = production groups which were: High (GroupI), Medium (Group II) and Low (Group III) for cows producing >500, 300 – 500 and <300 kg of milk, respectively, during the initial 30 days of lactation.

respectively. This increased calving interval by 53 days in the problem cows.

DISCUSSION

The disease incidence recorded in this study are comparable to those previously reported for Tanzania and elsewhere in the tropics (Mutiga et al., 1978; Rahumathura et al., 1986; Mgasa et al., 1990).

This study attempted to elucidate the effect of diseases on production and reproduction using case control methods described by Martin et al. (1987). Evidence provided by this study indicate that Mastitis, Metritis and Laminitis are detrimental to both milk production and fertility. Unlike other studies dealing with effects of one or two diseases on production or reproduction (Janzen, 1970; Lucey et al., 1986; Glatzsel, 1985) this report has observed that effects of health problems are multiple. Metritis, for example, was associated with reduced milk yield in addition to impaired fertility; Laminitis was related to both infertility and lowered milk yield, in addition to causing pain.

In this study, variation in incidence of mastitis, metritis, laminitis, anaplasmosis and trypanosomiasis according to level of milk production was observed. Increased disease incidence rates were recorded in the group with highest milk yield, with the exception of metritis whose incidence was highest in the medium production group. Lowest disease incidence rates were observed in the low milk producing group. This rise in the incidence of some diseases in dairy cattle with increased milk production has also been reported by Dohoo and Martin (1984) in a different environment from that of this study. Moreover it has to be borne in mind that diseases studied here except trypanosomiasis and anaplasmosis are included in the group of diseases associated with production (production diseases; Payne, 1970). Inherent in the terminology "production disease" is an association between level of milk production and incidence of disease. Suggested explanation for this association could be "stress" phenomenon. Exotic dairy breeds in the tropics are known to be under continuous environmental stress. Lactation aggravates this problem and the higher the milk yield, the greater is the stress (Thatcher and Collier, 1986). It is this aggravated stress which predisposed animals to health problems.

Table 2 a: Influence of milk production on reproductive performance.

Group	1st Mon yield (kg)	Lactation yield(kg)	Lactation Length(days)	Calving to service (days)
High (n=18)	563±12	4645±139	325±13[a]	97±10[a]
Mediume (n=58)	386±08	3605±84	346± 9[a, b]	99±6
Low (n=52)	246±05	2612±107	313±8[b]	122±10[a]
Overall (n=128)	389±18	3591±113	329±12	104±6

Table 2 b:

Service conception (number)	Calving conception (days)	Calving interval (days)
1.25±0.09[a,b]	111±8(a)	386±9(a)
1.72±0.11(a)	131±7	416±7(a)
1.64±0.12(b)	156±14[a]	433±13[a]
1.61±0.12	138±13	418±8

NB Numbers within columns with the same superscript are different ($p<0.05$). Group = production groups which were: High, Medium and Low: representing cows producing >500, 300 – 500 and <300 kg of milk during the first 30 days of lactation, respectively.

Table 3: Production parameters and fertility indices of health problem cows compared to controls.

Health Status	Lactation yield	Lactation length	Calving to service	Services conception^{-1}	Days conception	Calving interval
Metritis (n=9)	2841±207	279±14	142±17	2.20±0.21	188±18	467±19
Control (n=7)	3810±234	357±14	95±07	1.60±0.21	114±11	391±11
Mastitis (n=16)	3593±231	325±20	110±14	1.57±0.18	146±21	435±22
Control (n=16)	4634±198	352±10	83±07	1.59±0.18	135±17	416±15
Laminitis (n=7)	3662±213	351±11	166±07	2.24±0.25	191±09	471±10
Control (n=7)	4163±369	347±22	92±06	1.70±0.24	123±09	400±09
Pooled* (n=32)	3209±213	308±13	114±14	1.95±0.16	172±20	451±51
Control (n=30)	3851±169	335±12	96±08	1.60±0.15	120±08	398±09

NB: Figures are given as mean ± SEM; Lactation yields in kg and Lactation lengtyh, Calving to 1st service and calving interval in days, Pooles* = Pooled data.

These problems led to high (40%) involuntary culling rates in group one.

Milk production characteristics are of interest to note. Whereas mean milk yield during the initial 30 days of lactation in group 1 was 46% more than group II and 128% more than group III, total milk yield for the whole lactation in this group was only 28% and 78% higher than the two respective groups. This implied that lactation persistency in the high yielding group was lower than in other groups. Health problems could account for this.

Milk production per lactation could not be associated with lactation length in this study. The high yielding cows, for example, had intermediate lactation length whereas those with medium production had longest. The low yielding group had nevertheless the shortest lactation length which was accompanied by prolonged calving interval. This finding at least in low producers disapproves the theory that long intercalving intervals may be associated with more milk production as it allows long lactation length.

Good fertility in dairy cows is normally indicated by small magnitude of fertility indices. The negative correlation between milk yield and fertility parameters observed in this study means that high milk yield was associated with better. This observation, therefore, further confirms previous findings recorded in Tanzania (Kifaro, 1985). It however, contradicts with other observations made outside East African whereby antagonism between milk yield and fertility was reported (Smith and Farriers 1982; Hansen et al., 1983; Dong and Van Vleck, 1989). This

antagonism was not observed in this study. Dairy cows used in this study, produced less than half the amount of milk recorded for temperate countries. Pressure on these cows was therefore much less and hence the animals were less susceptible to fertility problems. Better fertility observed in the high milk yielding cows could be due to the importance attached to these animals by the owners and therefore better management.

Compared to other groups, the high yielding cows were more susceptible to health problems which needed greater control and more prompt attention. It was therefore concluded that the potential for high milk yield can only be realized if herd health management is intensified.

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