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Comparison of Milk Yield, Peak Yield and Lactation Length of Healthy and Mastitic Friesian Dairy Cows in Sudan*

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Abstract: The present study confirmed a significant (p<0.01) decrease in total milk yield in mastitis-infected cows compared to healthy ones, during first lactation. Moreover, during the second lactation, the previously infected cows showed a significant decrease (p<0.05) in milk yield, compared to the healthy and newly infected cows. Similarly, the newly infected cows in the third lactation revealed a significant (p<0.05) decrease in total milk yield compared to those from cows infected during the three successive lactations. However, they showed a significant increase (p<0.05) compared to cows infected during, both the first and third lactations. The newly infected cows in the third lactation showed a significant decrease (p<0.05) for milk yield on 305 days compared to cows infected during first and third lactations and cows infected during the three successive lactations. The lactation length showed a significant increase (p<0.05) only, when comparing cows infected during both the first and third lactations to those infected during both second and third lactation. The peak yield, although decreased due to infection, it only showed a significant decrease (p<0.05) during the second lactation, when comparing healthy and newly infected cows with those infected previously during, both the first and second lactations. In conclusion, mastitis reduces the production performance of the cows hence attention should be directed to the control of this costly disease.

Key words: Mastitis, milk yield, lactation length, peak yield

Introduction

The performance of the Friesian cows, imported to Sudan is not up to the expectations. Among a number of impediments, mastitis was one of the important factors (Mohamed, 1996). The persistence mastitis in the imported herds in Sudan cause severe tissue damage resulted in decease milk yield and greater economical values (Mohamed *et al*., 1995), as it was well known that mastitis depresses the milk yield (Lefcourt *et al*., 1993; Mohamed *et al*., 1999; Seegers *et al*., 2003). Moreover Grohn *et al*. (2004) reported that mastitic cows often never recovered their potential yield, especially in older cows.

The production losses in cows treated for mastitis varied with parity and stage of lactation and were modified by the SCC after treatment (Bennedsgaard *et al*., 2003). The consequences per cow/yr of mastitis in the default simulated herd included 0.42 clinical mastitis occurrences, 0.56 subclinical mastitis occurrences, loss of 385 kg milk yield, a 1.3% reduced feed intake, 61 kg milk withdrawal and

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146 in reduced economic net return (Ostergaard *et al*., 2005). Milk production loss from clinical mastitis during the whole lactation was estimated as approximately 598 kg for second-plus lactation cows, however, cows that contracted mastitis had a daily production advantage of 2.6 kg over their herd mates until they contracted the disease (Wilson *et al*., 2004). They also reported that when compared with this potentially higher milk production, the total loss from clinical mastitis was estimated as 1181 kg.

Shuster (1988) reported 35% decreased milk production in infused quarters, while reduction in uninfused quarters was 20%. Cameron and Anderson (1993) found strong relationship between somatic cell counts and milk production and that subclinical mastitis was a significant source of loss in milk production. Lefcourt *et al*. (1993) stated that milk yield for all quarters decreased by the first milking after *E. coli* endotoxin injection (0.5 mg).

The unfavourable genetic correlation between mastitis and milk yield, implies that single trait selection for increased milk production is expected to increase susceptibility to mastitis (Kulberg *et al*., 2002). In Sudan, Mohamed *et al*. (1999) reported the association between the reduction in milk yield and the week in which infection occurs as well as with the stage of lactation. They concluded that the earlier, in lactation the cows contracted the infection, the greater the losses in milk yield.

The present study was conducted in order to assess the impact of the mastitis on production performance of Friesian dairy herds raised under Sudan conditions. Records of 277 cows showing mastitis were evaluated for total milk yield, yield on 305 day, lactation length and peck yield as they were the most important productive parameters.

Materials and Methods

Source of Data

The data included in this study were collected during 1995 from the records of 227 lactating dairy cows of Butana dairy farm, Khartoum (Sudan). The data collected included 94 cows in their first lactation, 77 in their second lactation and 56 in their third lactation. The herd is composed of Holstein Friesian cows from a stock originally imported from the Netherlands in 1989. Using visual examinations and California Mastitis Test (CMT), the cows were grouped into healthy and mastitis-infected cows. Then the total milk yield, yield on 305 days, lactations length and peak yield of the selected cows were taken from the production records of the first three lactations.

Statistical Analysis

The mean differences between infected and healthy cows and the level of the probability were done during their first three lactations using t-test (Gill, 1978).

Results and Discussion

Total Milk Yield

Comparison of mean differences between healthy and infected cow's (Table 1) showed significant higher decrease ($p<0.01$) in milk yield, during first lactation. During the second lactation a significant decrease ($p<0.05$) was also obtained for previously infected cows compared to those from newly infected and healthy cows. This could be due to reduced milk yield as a result of mastitis which supported Cameron and Anderson (1993), Mohamed *et al*. (1995) and Mohamed *et al*. (1999). Moreover, Deluyker *et al*. (1993) reported that in a high-yielding low-somatic cell count (SCC) herd,

Table 1: The effect of mastitis on total milk yield during the first three lactations

Lactation number	Mean difference	Standard error difference	Probability
First lactation:			
Infected and healthy	-886.2799	412.472	0.017**
Second lactation:			
New infection and healthy	-340.4707	489.7695	0.2448
Infected previously and healthy	-1002.5417	546.4721	0.037*
Infected previously and new infection	-1002.5417	546.4721	0.037*
Third lactation:			
New infection and infected 3 and 2	-394.4226	608.4608	0.2601
New infection and infected 3 and 1	1103.4857	597.1778	0.039*
New infection and infected 1:2 and 3	-1059.8810	537.5602	0.029*
Infected 3 and 1 and infected 3 and 2	-1497.9083	1169.2589	0.1055
Infected 3 and 1 and infected 1:2 and 3	-2163.3667	576.5305	2.269
Infected 3 and 2 and infected 1:2 and 3	-665.4583	1063.0913	0.2682

* Significant at $p<0.05$, ** Significant at $p<0.01$

Table 2: The effect of mastitis on 305 days milk yield during the first three lactations

Lactation number	Mean difference	Standard error difference	Probability
First lactation:			
Infected and healthy	-743.253	251.169	1.96
Second lactation:			
New infection and healthy	-591.544	388.265	0.067
Infected previously and healthy	-743.375	515.426	0.078
Infected previously and new infection	-743.375	515.426	0.078
Third lactation:			
New infection and infected 3 and 2	-197.006	491.044	0.345
New infection and infected 3 and 1	-974.819	554.745	0.045*
New infection and infected 1:2 and 3	-860.714	487.249	0.045*
Infected 3 and 1 and infected 3 and 2	-1171.825	923.616	0.108
Infected 3 and 1 and infected 1:2 and 3	-1835.53	529.463	3.542
Infected 3 and 2 and infected 1:2 and 3	-663.708	832.643	0.216

* Significant at $p<0.05$

changes in milk yield were associated with SCC and occurrence of clinical mastitis. Table 1 also shows that in the third lactation there was a significant decrease ($p<0.05$) in milk yield when comparing the newly infected cow's milk yield with those infected in the three successive lactations. This supported Mohamed *et al.* (1999), Seegers *et al.* (2003) and Grohn *et al.* (2004). This might be attributed to the reduction in the milk yield due to mastitis as stated before by Seegers *et al.* (2003). As they reported that milk yield and composition can be affected by a more or less severe short-term depression and in case of no cure, by a long-acting effect and sometimes, an overlapping effect to the next lactation.

The newly infected cows in the third lactation revealed a significant ($p<0.05$) lower values of total milk yield compared to those from cows infected during the three successive lactations. However, an optimum significant increase ($p<0.05$) was found when comparing the newly infected cows to cows infected during first and third lactation. This might be due, as stated by Grohn *et al.* (2004), to the fact that mastitic quarters milk yield will never returned to its preinfection values. This might also be due as stated by Lucey and Rowlands (1984) as a result of damage of the udder or alternatively the cow may continue to be subclinically infected during the dry period and through the next lactation. The variations of the values obtained during the present study for the total milk yield could be due as stated by Bennedsgaard *et al.* (2003) that most of the variations in production related to SCC and mastitis was at the lactation levels.

Milk Yield on 305 Days

The only significant decrease ($p<0.05$) in mean differences of milk yield on 305 days (Table 2) was found for the newly infected cows as compared to cows infected during both the first and third lactation and cows infected during the three successive lactations. This was in support to

Table 3: The effect of mastitis on lactation length during the first three lactations

Lactation number	Mean difference	Standard error difference	Probability
First lactation:			
Infected and healthy	-37.374	29.276	0.095
Second lactation:			
New infection and healthy	39.969	33.153	0.116
Infected previously and healthy	13.688	29.769	0.324
Infected previously and new infection	13.688	29.769	0.324
Third lactation:			
New infection and infected 3 and 2	8.393	18.190	0.323
New infection and infected 3 and 1	64.743	19.022	1.169
New infection and infected 1:2 and 3	-18.857	16.589	0.133
Infected 3 and 1 and infected 3 and 2	56.350	34.814	0.05*
Infected 3 and 1 and infected 1:2 and 3	-83.600	18.237	6.60
Infected 3 and 2 and infected 1:2 and 3	-27.250	31.392	0.196

* Significant at $p<0.05$

Table 4: The effect of mastitis on peak yield during the first three lactations

Lactation number	Mean difference	Standard error difference	Probability
First lactation:			
Infected and healthy	-0.9054	1.1455	0.216
Second lactation:			
New infection and healthy	-0.4157	1.6345	0.40
Infected previously and healthy	-3.5917	2.1034	0.048*
Infected previously and new infection	3.5917	2.1034	0.048*
Third lactation:			
New infection and infected 3 and 2	-1.0077	1.9361	0.303
New infection and infected 3 and 1	-2.4819	2.5725	0.172
New infection and infected 1:2 and 3	-1.8786	2.1655	0.197
Infected 3 and 1 and infected 3 and 2	-1171.825	923.616	0.108
Infected 3 and 1 and infected 1:2 and 3	-1.4742	3.5562	0.3409
Infected 3 and 2 and infected 1:2 and 3	-0.8708	3.1323	0.3915

* Significant at $p<0.05$

Mohamed *et al.* (1999) and Grohn *et al.* (2004). Similarly Firat *et al.* (1993) reported that once cows had clinical mastitis in the current lactation they yielded significantly less milk in the following lactations.

Lactation Length

Lactation length showed non significant reduction when comparing the cows infected during the three successive lactations to each of the newly infected cows; cows infected during both first and third lactations and cows infected during both second and third lactation. However a greater significant ($p<0.05$) increase for mean differences was found for cows infected during both first and third lactation, when compared to cows infected during both second and third lactation (Table 3). This could be due to the fact that once the cow is acquired the disease in the first lactation, will never reach its full potential for milk yield (Lucey and Rowlands, 1984 and Grohn *et al.* (2004). However Koivula *et al.* (2005) found high genetic correlation (0.73) between Clinical mastitis (CM) in the first and second lactation, suggesting that susceptibility to mastitis remains similar across lactations. They added that genetic correlation between CM and milk yield traits was positive (from 0.38 to 0.56), confirming the genetic antagonism between production and udder health traits.

Peak Yield

The present study demonstrated the various reduction in peak yield as a result of mastitis (Table 4). The peak yield for milk production showed a significant decrease ($p<0.05$) when comparing the healthy cows milk yield to that of infected cows during both the first and second lactation. This could also be due to reduced yield of milk during mastitis (Mohamed *et al*., 1999; Seegers *et al*., 2003; Grohn *et al.,* 2004). A similar significant decrease ($p<0.05$) was also obtained in the second lactation when comparing the newly infected cows milk yield to those infected successively during first and second lactations. This might be a result of reduced the synthesizing ability of the mammary glands (Shuster, 1988) or alternatively cows continue to be subclinically-infected through the dry period in the next lactation (Lucey and Rowlands, 1984).

In conclusion mastitis reduces the production performance of the cows and the variations were associated to grater degree with the repeated attacks of the disease and the lactation length. Hence attention should be directed to the control of this costly disease with special consideration to highly producing cows and heifers to avoid the earlier culling. The tendency for higher producing cows to contract CM may mask its impact on cow health and production (Grohn *et al*., 2004).

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