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Survey on the Incidence of Reproductive Disorders in Dairy Cattle

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ABSTRACT

Intensive genetic selection has resulted in modern dairy cow with very high milk yields but reduced fertility, due mainly to an increase in reproductive disorders. The study was conducted to estimate the proportion of reproductive disorders among dairy cattle. The factors analyzed were; milk yield, cow parity, periparturient disorders, and reproductive status. The result of this study showed the incidence of reproductive disorders in high yielding dairy cows was prevalent. Repeat breeding was the major postpartum reproductive problem comprising (42.3%) of the samples. Higher reproductive disorders were also associated with lower parity. These disorders subsequently reduced reproductive performance by prolonged intervals from calving to first artificial insemination and from calving to pregnancy. Abnormalities in the reproductive system such as repeat breeder, silent heat, anestrous and ovarian cysts, as well as lower fertility have been recorded during the summer months (June to August). In conclusion, the study revealed that incidence of repeat breeder is mostly prevalent in dairy cows. Moreover, the incidence of reproductive disorders was higher in summer season and hence appropriate preventive and or therapeutic measures as per the type of abnormalities need to be undertaken.

(Key words : dairy cows, milk yield, reproductive performance, reproductive disorder)

INTRODUCTION

One of the critical factors for the success of a dairy operation is reproductive efficiency; while reproductive inefficiency contributes to the problems besetting the dairy industry today. In most modern dairy production systems, dairy cattle are inseminated and pregnancy is established while dairy cows are lactating. This resulted to the incidence of reproductive disorders, significantly affecting reproductive efficiency of dairy herds. These disorders include reduced conception rate (Kidder *et al.*, 1952; Haile *et al.*, 2014); high frequency of follicular atresia; hormonal disturbances (Cupps *et al.*, 1970; Islam *et al.*, 2013); postpartum anestrus (Jainudeen and Sharifuddin, 1987; Kumear *et al.*, 2013); and unobserved estrus (Albrechtsen, 1971; Tucker *et al.*, 2011).

Increased milk production has been the emphasis of genetic improvement programs. However, decreasing reproductive performance was observed coincident with increasing lactational yields (Butler and Smith, 1989; Butler, 2000; Barrett, 2000; Lucy, 2001). Substantial energy requirements at the onset of lactation in high yielding dairy cows result in a severe negative energy balance during the early lactation period (Bell, 1995), which may adversely impact postpartum health and fertility (de Vries *et al.*, 1999; Lucy *et al.*, 1991).

All animals have a range of ambient environmental temperatures termed the thermal neutral zone. This is the range of temperatures (−5～25℃) that is conducive to health and performance. The upper critical temperature is the point at which stress begin to affect the animal. Cattle can withstand low temperatures to −37℃ but dairy cattle are vulnerable to heat stress. Global warming has the potential to aggravate the impact of summer temperatures on vulnerable animals (Hahn, 1995). During this period, the influence of bioclimatic factors can easily be observed to lead to lower fertility.

This paper reports the incidence of various reproductive disorders and its effect on milk production in dairy cows.

MATERIALS AND METHODS

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1. Study Design

A prospective observational study on reproductive parameters and abnormalities of dairy cows was undertaken from February to September 2012. Individual cows or records included in the study were obtained either by interview and/or from individual record sheets. Data were used to calculate reproductive disorders for the last calving and their effect on reproductive performance.

2. Reproduction Parameters

Records on insemination, conception, and calving of dairy cows were used to determine the following basic reproduction parameters: days between parturition and first service; and days open (days between parturition and conception).

3. Reproductive Disorders

The various types of reproductive disorders were grouped into 4 categories: 1) Ovarian cysts which are fluid-filled structures ≥20～25 mm in diameter that persist in the absence of a corpus luteum (CL) for more than 10 days (Roberts, 1971; Kesler and Garverick, 1982; Garverick, 1997; Wiltbank *et al.*, 2002); 2) Anestrus, which is defined as the lack or absence of the expression of estrus; 3) Repeat breeder which is defined as the cow that has clinically normal reproductive track with normal or nearly normal oestrous cycles and oestrus periods and has been bred two or more times to a fertile bull but failed to conceive (Roberts, 1971); and 4) Silent heat, defined as a cow that has a normal reproductive cycle and ovulation takes place but there are no heat signs. However, the cow is often blamed for the shortcomings of the herdsman who does not notice the (week) heat signs (Gietema, 2005).

Distribution of reproductive disorders versus milk production and season of incidence was also examined. Milk yield was measured in the evening and in the morning. Dairy milk yield was computed as evening plus morning measured yield. The 305 days milk yield was estimated from test milk yields collected once a month during all lactation periods. The ranking of top class cow was divided high yielding cows. Months of the year were distributed into four seasons, namely spring (March to May), summer (June to August), fall (September to November), and winter (December to February).

4. Statistical Analysis

Data was subjected to the Generalized Linear Model procedure (PROC-GLM) of the Statistical Analysis System (SAS Institute, Cary, NC, USA). Differences among treatment means were determined using Duncan's multiple range tests. Statistical significance was established at $p<0.05$.

RESULTS

The incidence of each disorder observed in relation to the cowshed findings are summarized in Table 1. Repeat breeder had the highest incidence (42.3%); followed by anestrous (26.2 %); silent heat (22.8%); and ovarian cysts (8.7%).

The effect of parity distribution on reproductive disorders is shown in Table 2. Cows in the 2nd parity had the highest number of disorders. Cows with parities of 1, 2 and 3 have more reproductive disorders than those with aparity of 4, 5, 6 and higher.

Higher milk yield was found to be correlated with poor reproductive performance (Table 3). The proportion of cows with reproductive disorders was higher (65.5%) in the high yielding (Group A) than in the other group. Each performance trait measured was adversely affected by reproductive abnormalities of cows in Group A. High yielding cows had longer

Table 1. Distribution of the case of reproduction

Problems	No. of cases	Percent of case (%)
Repeat breeder	63	42.3
Silent heat	34	22.8
Anestrous	39	26.2
Ovarian cysts	13	8.7
Total	149	100

Table 2. Parity distribution for reproductive disorders

Parity	No. of disorders	Percent of disorders (%)
1st	31	20.8
2nd	44	29.5
3rd	34	22.8
4th	12	8.1
5th	13	8.7
Over 6th	15	10.1
Total	149	100

Table 3. Summary of reproductive traits with different levels of milk production per cow

Milk yield (kg)	No. of dairy cattle	Reproductive disorders (%)		Days open Mean ± S.D. (days)	Interval to first AI Mean ± S.D. (days)	Estrous detection rate (%)	First AI conception rate (%)
		Normal	Abnormal				
Group A	29	10 (34.5)	19 (65.5)	232.3 ± 38.2	89.9 ± 6.5	38.2	18.4
Group B	114	73 (64.0)	41 (36.0)	159.3 ± 23.2	80.4 ± 2.9	40.8	37.7

* Group A: High yielding cows (13,000～15,000kg), Group B: Low yielding cows (8,000～10,000kg).

intervals from calving to first service. Consequently, first service conception rates and overall pregnancy rates were lower in cows with reproductive abnormalities.

Reproductive problems are encountered frequently over the course of a breeding season (Table 4). Reproductive abnormalities were occurred in summer (43.9%), spring (32.5%), fall (33.3%), and winter (30.9%). The interval from calving to first service and days open were greater for cows during summer than in the other seasons.

DISCUSSION

Breeding efficiency is the key to a profitable herd. To maximize the productive life of dairy cattle, it should be bred within 80～90 days after parturition and a new lactation cycle should be started every 13～13.5 months (Abdalla, 2003). However, comparing reproductive performances, the modern dairy cow has decreased fertility (Butler, 2000) which has become the number one reason for involuntary culling (NAMHS, 2007). Causes of reproductive failure are categorized into repeat breeding, silent heat, anestrus and ovarian cysts.

The result of this study concurs with the findings of earlier researches on the effects of increased lactation on reproductive efficiency of dairy cows. Repeat breeders had the highest incidence of reproductive disorders.

Repeat breeding can be a major factor involved in infertility. These cows are characterized by low fertilization rates (Graden *et al.*, 1968) and early embryonic loss (Gustafsson and Larsson, 1985), thereby decreasing overall conception rates (Ferreira *et al.*, 2010; Yusuf *et al.*, 2010). Potential causes of repeat breeding include sub-clinical infection of reproductive tract (Rao, 1982), age of the animal (Barlett *et al.*, 1986), errors in detection of oestrus (DeKriuf, 1978), endocrine dysfunction (Gustafsson *et al.*, 1986), nutritional deficiencies and others (Francos *et al.*, 1977).

Silent heat is regarded as one of the most prominent infertility problems in dairy farms, affecting about 40～60% of post-partum periods (Claus *et al.*, 1983; Schopper *et al.*, 1993). The high rate of silent heat is mainly a result of bad oestrus detection (Mwaanga and Janowski, 2000; Opsomer and Kruif, 1999). According to some authors, the elevated progesterone levels during oestrus and inhibition of oestrus behavior result to negative energy balance in high yielding cows (Ras, 1999).

Previous research has shown that anoestrus after AI result

Table 4. Summary of reproductive traits during different seasons of the year

Season	No. of dairy cattle	Reproductive disorders (%)		Days open Mean ± S.D. (days)	Interval to first AI Mean ± S.D. (days)	Estrous expression rate (%)	First AI conception rate (%)
		Normal	Abnormal				
Spring	52	35 (67.5)	17 (32.5)	153.4 ± 9.1^{BC}	86.5 ± 3.8^{B}	43.6	36.9
Summer	123	69 (56.1)	54 (43.9)	215.7 ± 11.3^{A}	101.1 ± 6.1^{A}	36.2	29.9
Fall	66	45 (66.7)	21 (33.3)	180.4 ± 9.9^{B}	90.1 ± 4.1^{AB}	38.1	34.6
Winter	81	56 (69.1)	25 (30.9)	142.3 ± 10.4^{C}	85.0 ± 5.1^{B}	40.7	44.0

* Values with different superscripts ($^{A\sim C}$) differ within row ($P<0.05$).
** Estimated milk yields at 305 days in milk: 9,055.3 ± 1,173.7 kg.

to elongation of service period, and consequent economic losses. Several factors affect postpartum anestrous such as nutrition plane, milk yield, body condition score (BCS) at calving, suckling, parity and calving season (Shah *et al.*, 1986; Barile, 2005; El-Wishy, 2007). Another major cause of economic loss in dairy operations is ovarian cysts; cows diagnosed with cysts exhibit extended calving intervals (Bartlett *et al.*, 1986).

Ovarian cysts in dairy cows have been reported to be a major cause of economic loss and reproductive dysfunction in dairy operations (Garverick, 1997), and cows diagnosed with cysts often exhibit extended calving intervals (Bartlett *et al.*, 1986). The risk factors for ovarian cysts include milk production volume (Johnson *et al.*, 1966), estrogen content of forages (Barga, 1987), and uterine infections (Bosu and Peter, 1987; Peter *et al.*, 1989).

High-yielding dairy cows are generally in negative energy balance in early lactation and mobilize body reserves for milk production (Butler and Smith, 1989). They undergo a high level of nutrient partitioning and adipose tissue mobilization during early lactation (Bauman and Currie, 1980). Loss of body condition score is greater and more prolonged for higher yielding cows (Gallo *et al.*, 1996). A negative energy balance may be associated with a higher incidence of metabolic disorders, impaired fertility and other health problems (Rauw *et al.*, 1998).

Reduced fertility is often linked to exposure to heat stress before insemination (Al-Katanani *et al.*, 1999; Putney *et al.*, 1989). Intrauterine environment is also violated in cows exposed to thermal stress and to changes such as reduced blood flow and increased body temperature (Roman-Ponce *et al.*, 1978). This change was found to be associated with early embryonic mortality and unsuccessful insemination (Rivera and Hanse, 2001). Dobson *et al.* states that in 1960, pregnancy rate of cows from first insemination was about 90% while in 2007, it was about 55%. Oestrus became shorter and the influence of heat stress much higher; both reduce the success of AI. Service period lasts between 115 and 140 days for cows with hard calving (assisted calving), laminitis, and endometritis, compared with 85 days service period for cows without puerperal disorders.

In summary, health cows are critical to maintain optimum reproductive performance. To prevent economic losses, cattle herds should have quality nutrition, yearly pregnancy checks, and disease prevention. Reproductive goals should include maximizing the herd's pregnancy rate, the number of cows bred early in the breeding season, and the number of calves born early in the calving season thus increasing the producer's ability to make a profit.

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