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Effects of Different Dry Period Lengths on Milk Yield and Milk Composition of Dairy Cattle under Iranian Herd Management Conditions

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ABSTRACT

Retrospective analyses of data have established that 7-9 week is optimal dry period length, but recently few studies with controlled conditions have shown minimal effects of short dry periods. Objective of this study was evaluating the effects of different dry periods (35 day, 42 day and 56 day) on milk yield of Holstein dairy cows under Iranian management conditions. One-hundred twenty Holstein dairy cows were assigned in a 3×2×2 factorial design including; dry period (35 d, 42d and 56 d), BCS (BCS<3.2 and BCS≥3.2) and milk yield (yield≥20 and yield<20). Milk yield and milk composition was recorded daily and weekly, respectively up to 8th week of lactation. Analysed data revealed there were no differences between 35 and 56 days dry period on milk yield of cows in the subsequent lactation (36.51 vs. 38.87; p = 0.14). Milk yield of 56 dried days cows was greater than 42 days dried cows (38.87 vs. 34.91; p = 0.01). Milk yield of high BCS cows with 56 dry periods tended to increase comparing with 35 days dried, but it was not significant (41.5 vs. 37.44; p = 0.08). There was significant difference between 35 and 56 days dry regarding their milk yield of high-producing cows (37.15 vs. 44.43; p = 0.003). High-producing cows with high BCS showed a significant milk loss due to 35 days dry compared with 56 days dry (36.8 vs. 46.45; p = 0.009). These data indicated that short dry period might be a good management strategy that high-producing cows need more time for regenerating the mammary epithelial tissue. Additional milk yield from extended lactation in the current lactation compensated all of the milk loss due to shorter dry period in the subsequent lactation for 42 d and 35 d groups.

INTRODUCTION

Dry period is necessary for having successful lactation (Capuco et al., 1997). There are abundant data that have demonstrated dry periods less than 40 day reduced milk yield in the subsequent lactation by 5 to 15 % (Klein and Woodward, 1943; Wilton et al., 1967; Coppock et al., 1974; Funck et al., 1987; Sørensen and Enevoldsen, 1991; Makuza and Mcdaniel, 1996). There are hypothesis describing the reasons of milk loss due to short dry periods in the subsequent lactation as following; (1) Inadequate time for complete

replenishment of body reserves (Swanson, 1965), (2) Reduced mammary epithelial regeneration (Swanson et al, 1967; Capuco et al., 1997), and (3) Incomplete endocrine events (Smith et al., 1967) near the calving. Most of these data are from observational studies and no statistical analyses have been used. In recent years because of the genetic and management improvements, milk yield of these cows have increased significantly and seems that shortening dry period should be reevaluated considering today's high producing cows. Although there are few controlled studies with randomized assignments of cows subjected to different short dry periods, but these studies have shown that short dry periods (30 days) had no negative effect on milk yield of subsequent lactation (Rémond et al., 1997; Bachman, 2002; Bachman and Schairer, 2003; Gulay et al., 2003; Rastani et al., 2003; Annen et al., 2004). Omission of the complete dry period resulted 20-40 % milk loss in the subsequent lactation (Swanson, 1965; Smith et al., 1967; Rémond et al., 1992). Thus, objective of current study was evaluating the effects of different dry periods (35 day, 42 day and 56 day) on milk yields of Holstein dairy cows under Iranian management conditions.

MATERIALS AND METHODS

One-hundred twenty Holstein dairy cows were assigned to evaluating the effects of shortening dry periods on cows with different Body Condition Scores (BCS) and their milk yield. Treatments were arranged in a 3 × 2 × 2 factorial design that included dry period (35 d, 42 d and 56 d), BCS (BCS < 3.2 and BCS ≥ 3.2) and milk yield (yield ≥ 20 and yield < 20). One individual assigned BCS on a 5 point scale beginning about 60 d before expected calving date and continued 30 d before expected calving date and day of calving. Milk production was recorded daily in three consecutive milking and milk composition was collected weekly up to 8th week of lactation. All of cows were fed Total Mixed Ration (TMR) two times per day to meet their productivity and pregnancy requirements.

Cows assigned to 35 day group, at the time of milk stasis were removed to close-up dry cow pen and fed a close-up ration. Cows in 42 d and 56 d at the time of milk stasis were transitioned to far-off dry cow pen until 35 day before expected calving date then removed to close-up pen and fed close-up ration. Data were analyzed with PROC MIXED procedure of SAS (v.8.2.SAS 1999).

RESULTS AND DISCUSSIONS

There were no differences between 35 and 56 days dried respecting the milk yield of cows in the subsequent lactation (36.51 vs. 38.87; $p = 0.14$). These results confirm similar studies (Schairer, 2001; Bachman, 2002 and Gulay et al., 2003). The milk yield of 56 days dry cows was greater than 42 days dry cows (38.87 vs. 34.91; $p = 0.01$). These results could be interpreted by improved energy balance due to direct transition

of 35 d group to close-up pen, while 42 d and 56 d groups had more nutritional stress than 35 d group. Cows grouped in 35 days dry had only one change in diet, while 42 d and 56 d groups had two changes in diet. Because of rapid changes in diet of 42 d group, the nutritional stress was obvious in 42 d compared with 56 d. No significant differences were detected due to 35 and 56 days dried periods regarding milk yield of high BCS (37.44 vs. 41.5; $p = 0.08$) and low BCS cows (35.58 vs. 36.24), but milk yield of high BCS cows with 56 dry period tended to increase. There was significant effect between 35 and 56 days dry on milk yield of high-producing cows (37.15 vs. 44.43; $p = 0.003$). Milk yield of low-producing cows with 35 and 56 days dry period were not significant in subsequent lactation. High-producing cows with high BCS showed a significant milk loss due to 35 days dry compared with 56 days (36.8 vs. 46.45; $p = 0.009$). Although milk yield of high-producing cows (yield$\geq$20 kg/d at milk stasis time) was higher than low-producing cows due to shorter dry periods in the subsequent lactation, but ratio of milk losses was greater in high-producing cows compared with low-producing cows. These results indicated that high-producing cows may need more than 35 days drying for complete regeneration of mammary epithelial tissue. However, profitability in high-producing cows was improved through increased net milk income generated by shortening the dry period. There was no interaction between low-producing and low BCS cows with dry period lengths. Milk protein, fat, lactose and SCCwere not affected by treatments.

CONCLUSION

Respecting all the data individually and all together more or less is similar to other studies. There were no differences between 35 and 56 days dry on milk yield of cows, but milk yield of 42 d group was lower than two other groups. Significant milk loss of 42 d treatment could be contributed to more nytritional stress in compared with 35 and 56 d treatments. High-producing cows showed more reduce in in milk yield in compared with low-producing cows due to shortening the dry period. These implies that high producers are more sensitive to shortening dry periods. Phsiologically this fact is true because the limited source of digestive system for high producers is not able to overcome these deficiencies. . It is concluded that presumably high-producing cows need more time for regenerating the mammary gland epithelial tissue. In this respect evaluating the insuline, growth hormone and particularly IGF as somatomedians would reveal considerable and interesting results.

However, the additional milk produced during the extra 21d and 14 d in the previous lactation from 35 and 42 days dry, added additional value to the short dry period management scheme and 35 days dry proposing for all of the herd cows, except of fatter high-producing cows.

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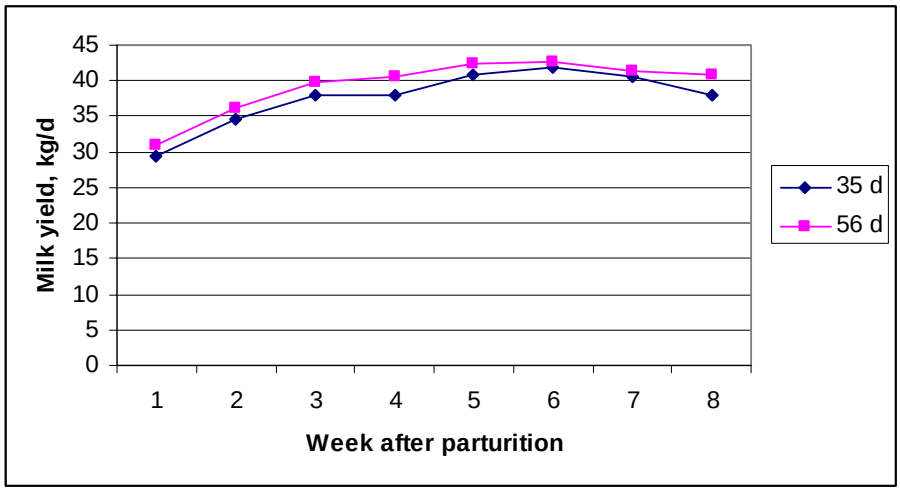

Figure 1. Milk yield during early 8 wk of the next lactation in cows subjected to a 56 or 35 day dry period.

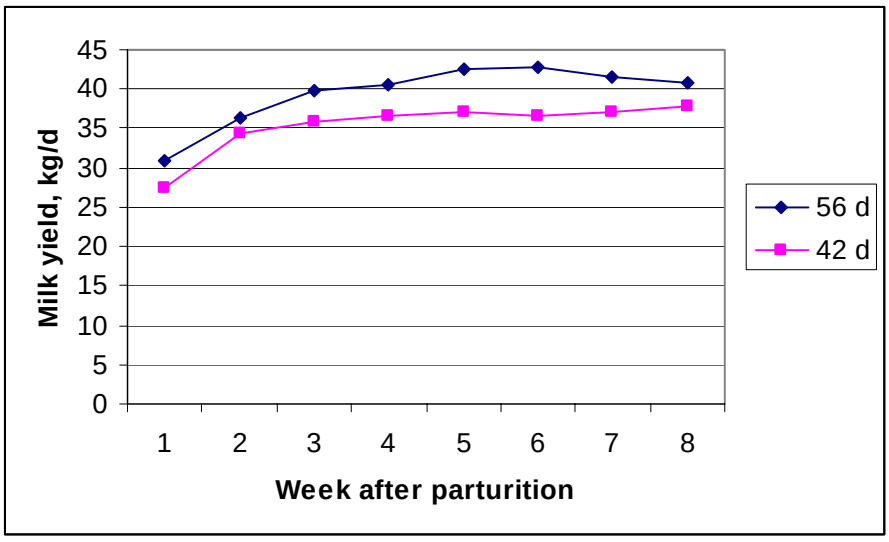

Figure 2. Milk yield during early 8 wk of the next lactation in cows subjected to a 56 or 42 day dry period.