

## The Effect of Live Weight and Age of Dam on Milk Biochemistry of Machine Milked Cows

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**Abstracts:** The objective of this research is to investigate the effect of live weight (LW) and age of dam (AD) on milk biochemistry of machine milked cows. The data were obtained from 52 machine milked Holstein cows in early lactation period. The cows were fed a total mixed ration (TMR). The milk fat levels of heavy dams were significantly higher compared to the light dams. The total solids and pH levels of cows did not differ between heavy and light animals. Milk components of cows were not affected by different AD.

**Key words:** Lactation, live weight, age, milk biochemistry, machine milking, cow

### INTRODUCTION

The milk components can influence the quality and yield of milk (Lynch, J.M., D.M. Barbano, 1992). Understanding the effective factors on milk components is a major importance to the dairy industry. However, studies on the use of machine milking in dairy farm conditions are sparse (Cetin, M., M. Cimen, 2007; Cimen, M., M. Cetin, 2008). It was reported that milk composition was affected by milking methods in breeds because they have different autocrine control of milk secretion (Chaudhary, A.P., O.S. Parmar, 1998). Nevertheless, research investigating the changes of fat, pH and dry matter in milk of machine milked during early and late lactation months has been limited. Little is known about factors affecting milk components and their relationships in early lactation period. Recent studies have documented the effects of environmental factors such as machine milking (Cetin, M., M. Cimen, 2007; Bencini, R., 1993; Cetin, M., M. Cimen, 2007), animal behavior (Dilmac, M., M. Cimen, 2007; Cimen, M., 2007) live weight (Cimen, M., M. Karaalp, 2008) and breed (Cimen, M., M. Karaalp, 2007) on milk components. The aim of this research is to present some basic knowledge about factors such as machine milking, live weight and age of dam that influence milk composition in dairy cows.

### MATERIALS AND METHODS

The experiment was conducted at DIMES Kazova Animal Farm. The data collected from 52 machine milked Holstein cows in early lactation period. In the experiment, 26 heavy (H) and 26 light (L) cows were used. The means weight of animals were recorded as 700 kg and 550 kg for H and L, respectively. Both experimental group reclassified based on their age as 3 years old (3Y) and 6 years old (6Y). The cows were fed a total mixed ration (TMR). To determine milk composition, samples were obtained on observation days in early lactation periods by hand-milking from all animals used in this experiment. The samples were collected into plastic vials preserved with micro tabs, stored 4 °C until analyzed for determination of total fat, total solids and pH. The milk fat was determined by Roese-Gottlieb Method (Hundrieser, K.E., R.M. Clark, 1984) Milk pH was determined using a Xerolyt electrode (model HA 405; Ingold Electrode, Wilmington, MA). Total solids were determined by drying a known mass of milk at 102 ± 1°C. Independent Samples *t*-test was performed on data using SPSS.

### RESULTS AND DISCUSSIONS

The milk fat level of L cows was significantly lower ( $P < 0.05$ ) compared to the H group (Table 1). Cimen *et al.*, (2008) reported that light animals were shown to be more sensitive to milk fat depression than heavy

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ones in early lactation period. Characteristically, light dam synthesizes and secretes more energy (in her milk) than she can consume in feed. She can not eat enough to meet her energy need in early lactation in which body fat reserves are necessary to allow her to mobilize energy for high production (Schroeder, J.W., 2001). Hence, L animals may not have sufficient reserves for milk and fat production in this period. As a consequence, L animals experience a more severe negative energy balance, which is associated with an increased risk of metabolic disorders and milk fat syndrome in early lactation period (Goff, J.P. and Horst, R.L., 1997).

**Table 1:** Means and standard errors for milk biochemical parameters in different weights.

Parameters	Group	
	H	L
Total fat (%)	3.36±0.12 *	2.96±0.13
Total solid (%)	11.37±0.38	11.32±0.30
pH	6.29±0.30	6.31±0.17

\* (P<0.05)

It has been reported that live weight can affect milk composition (Berry, D.P., F. Buckley, 2007). However, influence of live weight on total fat, total solids and pH of milk values was not apparently discussed by the authors. It is known that normal milk secretion is under a complex endocrine control and undoubtedly differences in endocrine function are an important source of differences in yield and composition of milk of different individual cows. There is no doubt that weight factor govern an important amount of the variation in milk composition. One explanation to this result is that the compartment for energy distribution in a big cow is naturally larger than in a small cow, and if the large amount of energy is formed in the citric acid cycle of big animals, concentrations in blood and milk will obviously be higher. The effect of weight on energy concentration such as fat and glucose will also depend on the absolute amount of energy components to be distributed in the body. The differences among individuals within a breed are often greater than differences among breeds.

The total solids and pH levels of cows did not differ between H and L groups. Fresh milk has a pH of 6.7 and is therefore slightly acidic. In this research, pH levels in milks of groups were within normal ranges.

As shown the Table 2, milk components of cows were not affected by different ages. It has been reported that age had no significant effect on milk constituents such as fat (Egbowon, B.F., O.A. Osiniowo,). However, according to Lubritz *et al.*, (1989) the age of dam has an effect on milk composition (Lubritz, D.L., K. Forrest, 1989). The reason for this differential response is not readily apparent in this literature. Breeds may differ in average milk composition and between individual cows within the breed there is even greater variation. The quantities of the main milk constituents can vary considerably depending on the individual animal, its breed, stage of lactation, age and health status. Herd management practices and environmental conditions also influence milk composition (Lubritz, D.L., K. Forrest, 1989).

**Table 2:** Means and standard errors for milk biochemical parameters in different ages

Parameters	LN	
	3Y	6Y
Total fat (%)	3.54±0.15	3.27±0.10
Total solid (%)	11.13±0.39	11.06±0.28
pH	5.96±0.27	6.15±0.22

One of the most important results in our study was that the means of biochemical parameters in milk of all groups from machine milking were different than some reported results for machine milked cows (Cimen, M., M. Cetin, 2008) whereas the means of milk biochemical parameters in groups were coincide with the normal values of cows for early lactation period in literature (Koneko, J.J. and C.E. Cornelius, 1980).

From the results, the live weight has significant influence on the milk fat level. Further study is needed to research on basic milk parameters such as pH, fat and total solids of machine milked cows.

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## REFERENCES

- Lynch, J.M., D.M. Barbano, D.E. Bauman, G.F. Hartnell and M.A. Nemeth, 1992. *J. Dairy Sci.*, 75: 1794.
- Cetin, M., M. Cimen, M. Dilmac, E. Ozgoz and M. Karaalp, 2007. *Asian Journal of Chemistry*, 19(3): 2135-2140.
- Cimen, M., M. Cetin, M. Karaalp and S. Sahin, 2008. *Indian Vet. J.* (in press).
- Cimen, M., M. Cetin, 2008. Evaluation of milk constituents and quality under machine milking cows. Proc .6th Wld. Cong. Genet. Appl. Livest. Prod., 25: 11-14.
- Bencini, R., 1993. The Sheep as a Dairy Animal: Lactation, Production of Milk and its Suitability for Cheese Making, PhD thesis, The University of Western Australia.
- Cetin, M., M. Cimen, E. Ozgoz and R. Gurhan, 2007. *Indian Vet. J.*, 84: 832-835.
- Dilmac, M., M. Cimen, E. Ozgoz and S. Yildirim, 2007. *Indian Vet. J.*, 84: 951-953.
- Cimen, M., 2007. *Asian Journal of Chemistry*, 19(4): 3152-3156.
- Cimen, M., M. Karaalp and M. Elmastas, 2008. *Asian Journal of Chemistry*, 20(5): 3885-3888.
- Cimen, M., M. Karaalp and S. Sahin, 2007. *Asian Journal of Chemistry*, 19(1): 600-606.
- Hundrieser, K.E., R.M. Clark, R.G. Jensen, A.M. Ferris, 1984. *Nutr. Res.*, 4: 21-26.
- Schroeder, J.W., 2001. Feeding and Managing the Transition Dairy Cows. PhD Thesis. NDS University, North Dakota.
- Goff, J.P. and Horst, R.L., 1997. *J.Dairy Sci.*, 80: 1260.
- Berry, D.P., F. Buckley and P. Dillon, 2007. *Animal*, 1: 1351-1359.
- Egbowon, B.F., O.A. Osiniowo, W.O. Biobaku, M.A. Dipeolu. *Archivos de Zootecnia*, 54: 643-646.
- Lubritz, D.L., K. Forrest, O.W. Robison, 1989. *Anim. Sci.*, 67(10): 2544-2549.
- Koneko, J.J. and C.E. Cornelius, 1980. *Clinical Biochemistry of Domestic Animals*, 3<sup>rd</sup> Ed. Academic Press, New York, pp: 41-376.