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Relationship Between Some Teat and Body Measurements of Holstein Cows and Sub-Clinical Mastitis and Milk Yield

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Abstract: The objective of this study was to determine the relationship between some teat and body measurements of lactating cows and sub-clinical mastitis and milk yield. The material was consisted of 125 Holstein cows. The teat diameter, length and height from floor surface, wither height, hip height and chest girth of cows were measured. The cows were grouped according to Californian Mastitis Test (CMT) score as positive (CMT Score: 2-4) and negative (CMT Score: 0 and 1) and also according to the 305 days corrected milk yield as low (≤5000 kg) and high (>5000 kg) milk production. The significant differences were found between sub-clinical mastitis groups in terms of teat height, left and right hind teat diameter and right hind teat length ($p<0.05$). About 305 days corrected milk yield means of positive and negative sub-clinical mastitis groups were 5185.91±180.81 and 4994.94±210.80 kg, respectively. There were no statistically significant differences with regard to milk yield and body measurement between sub-clinical mastitis groups. There were no significant differences between milk yield groups with regard to teat measurements except for right front and hind diameter means ($p<0.05$). The means of wither height, hip height and chest girth according to low and high milk yield groups were found significant ($p<0.001$).

Key words: Holstein cows, sub-clinical mastitis, milk yield, teat measurement, body measurement, Turkey

INTRODUCTION

Udder structure and frame size of milking cows are not only important to demonstrate the morphological characteristics or aesthetics but also a high milk output of the breeds. Mammary properties are directly involved in economic production in dairy cows. Both morphologic and physiological mammary properties affect milk yield. Tilki *et al.* (2005) determined that teat length and udder height had significant effect on milk yield and 305 days milk yield decreased with increasing rear teat length and milk yield increased with decreasing udder height of Brown Swiss cows. In some studies, the positive correlations were determined between the some udder and body measurements and milk yield in different genotypes of dairy cattle (Heinrichs and Hargrove, 1987; Lin *et al.*, 1987). Bardakcioglu *et al.* (2004) reported that Holstein cows with higher mean wither height and body weight produce more milk than those with lower wither height and body weight.

In dairy farms, the conflict with diseases such as mastitis is very important as well as high milk yield. Mastitis is an infection of mammary gland resulting in significant economic losses in dairy industry. Annual economical losses due to mastitis in USA have been reported to be nearly 2 billion dollars (National Mastitis Council, 1996). The morphological traits of the udder and teat could affect the mastitis risk. Seker determined that the difference between CMT positive and negative groups in terms of fore teat length was not statistically significant in Brown Swiss cows. Uzmay stated that the cows having long-thick teat had the most risk for sub-clinical mastitis. Yamazaki *et al.* (2009) reported that cows that had high rates of increase in milk yield and high milk yields in early lactation were predisposed to udder disease afterwards and cows with high milk production over a long period but with low lactation persistency were predisposed to udder disease after the peak of lactation.

The aim of this study was determine the relationship among milk yield, sub-clinical mastitis and some udder and body measurements of Holstein cows.

MATERIALS AND METHODS

The study was conducted on 125 Holstein cows that were housed in a private dairy enterprise in Aydin, Turkey. The cows were milked twice a day; milk production records of the calved cows were taken monthly. Body and teat measurements of each cows were recorded at the 2nd, 5th and 8th months of the lactation

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and were evaluated the means of this traits. Teat and body measurements were taken after the evening milking. Wither height was measured by the distance between wither and floor, hip height was measured by the height of the rump between hips, chest girth was determined by measure the narrowest circumference of the body, teat heights were measured by the distance between each teat and floor, teat lengths were measured by calipers and teat diameters were measured at the middle of each teat by calipers.

Lactation milk yield, 305 days corrected milk yield and mature equivalent milk yield means were evaluated. Milk samples were taken from each of the teats for California Mastitis Test (CMT).

The cows were grouped and analyzed according to mastitis score as positive (CMT = 2-4) and negative (CMT = 0 and 1) and also as low (≤5000 kg) and high (>5000) milk produced cows according to the 305 days corrected milk yield. To determine statistical differences between body, teat measurement and milk yield within mastitis score and milk yield groups were analyzed with Student's t-test. Milk yield-subclinic mastitis interaction were analyzed with analysis of covariance and Chi-square (χ^2) tests using by SPSS 10.0 packed program.

RESULTS AND DISCUSSION

The relationship between some teat, body measurements, milk yield and sub-clinical mastitis was shown in Table 1 and 2 although, the relationship between some teat and body measurement and 305 days corrected milk yield of Holstein cows was shown in Table 3. The number of subclinic mastitis positive cows were found 19 (29.2%) and 46 (70.8%) for high and low milk yield groups respectively and the difference were not significant ($p>0.05$) (Table 4).

Teat diameter means were higher in the mastitis positive group than mastitis negative group; however statistically significant difference between groups were found for only left and right hind teat diameters ($p<0.05$). The differences between mastitis groups with regard to teat length were not statistically significant except for the right hind teat length ($p<0.05$) and the mean values of right hind teat length for positive and negative sub-clinical mastitis groups were found 4.46±0.10 and 4.87±0.13 cm, respectively.

All the mean values of teat height for negative sub-clinical mastitis group were higher than positive group and the differences between groups were significant ($p<0.05$). About 305 days corrected milk yield, wither height, hip height and chest girth means of positive and negative sub-clinical mastitis groups were 5185.91±180.81 and 4994.94±210.80 kg, 137.77±0.61 and 138.57±0.50 cm, 140.76±0.57 and 141.52±0.54 cm, 194.63±1.14 and 191.05±3.09 cm, respectively. There were no statistically significant differences about milk yield and body measurement among sub-clinical mastitis groups.

Table 1: Some teat measurements in the sub-clinical mastitis groups

		Mastitis groups ($\bar{X} \pm S_{\bar{x}}$)		
Teat measurement means	Position	Positive (n = 65)	Negative (n = 60)	Significance
Teat diameter (cm)				
Left	Front	2.00±0.04	1.99±0.04	NS
	Hind	2.11±0.08	1.87±0.05	*
Right	Front	2.07±0.05	1.95±0.04	NS
	Hind	2.02±0.06	1.78±0.03	**
Teat length (cm)				
Left	Front	5.51±0.12	5.58±0.14	NS
	Hind	4.69±0.08	4.62±0.11	NS
Right	Front	5.29±0.13	5.19±0.15	NS
	Hind	4.46±0.10	4.87±0.13	*
Teat height (cm)				
Left	Front	50.63±0.82	53.50±0.86	*
	Hind	49.53±0.78	52.46±0.91	*
Right	Front	48.16±0.59	51.83±0.90	**
	Hind	48.95±0.80	51.80±0.97	*

NS: Non Significant. *p<0.05, **p<0.01

Table 2: Some body measurements and milk yield values in sub-clinical mastitis groups

	Mastitis groups ($\bar{X} \pm S_{\bar{x}}$)		
Body measuremets and milk yield means	Positive (n = 65)	Negative (n = 60)	Significance
Lactation milk yield (kg)	5194±177	4882±204	NS
Mature age corrected milk yield (kg)	4529±153	4460±195	NS
305 days corrected milk yield (kg)	5185±180	4994±210	NS
Wither height (cm)	137.77±0.61	138.57±0.50	NS
Hip height (cm)	140.76±0.57	141.52±0.54	NS
Chest girth (cm)	194.63±1.14	191.05±3.09	NS

NS: Non Significant

Table 3: Some teat and body measurements in milk yield groups

		Milk yield groups ($\bar{X} \pm S_{\bar{x}}$)		
Teat and body measurement means	Position	Low (n = 46)	High (n = 79)	Significance
Teat diameter (cm)				
Left	Front	1.93±0.05	2.03± 0.04	NS
	Hind	1.92±0.07	2.03±0.07	NS
Right	Front	1.91±0.04	2.07±0.04	*
	Hind	1.72±0.05	2.01±0.05	***
Teat length (cm)				
Left	Front	5.71±0.13	5.44±0.12	NS
	Hind	4.60±0.13	4.69±0.07	NS
Right	Front	5.22±0.18	5.26±0.12	NS
	Hind	4.70±0.14	4.63±0.10	NS
Teat height (cm)				
Left	Front	53.24±1.04	51.29±0.73	NS
	Hind	51.61±1.07	50.54±0.74	NS
Right	Front	50.95±1.00	49.32±0.65	NS
	Hind	50.88±1.07	49.99±0.79	NS
Wither height (cm)	-	135.51±0.39	141.10±0.46	***
Hip height (cm)	-	137.25±0.39	141.10±0.46	***
Chest girth (cm)	-	188.83±1.01	198.02±0.74	***

NS: Non Significant, *p<0.05, ***p<0.001

Table 4: Numbers of cows among milk yield-subclinic mastitis groups

		Subclinic mastitis		
Milk yield (kg)	Number	Positive	Negative	Total
<5000	n	19.0	27.0	46.0
	%	29.2	45.0	36.8
>5000	n	46.0	33.0	79.0
	%	70.8	55.0	63.2
Total	n	65.0	60.0	125.0
	%	100.0	100.0	100.0

χ^2 = 3,336 NS

There were no significant differences between milk yield groups in terms of teat measurements except for right front and hind diameter means ($p<0.05$). The means of wither height, hip height and chest girth according to low and high milk yield groups were 135.51±0.39 and 141.10±0.46 cm, 137.25±0.40 and 142.10±0.53, 188.84±1.02 and 198.03±0.75 cm, respectively and the differences between groups were significant ($p<0.001$). There is no significant interaction found with analysis of covariance between milk yield and subclinic mastitis groups ($p>0.05$) In the study, teat diameter means were higher in the mastitis positive group than mastitis negative group, similarly to the result of Alacam. The differences between mastitis groups with regard to teat length were not statistically significant except for the right hind teat length ($p<0.05$) and the means of the right hind teat length was higher in positive group for su-bclinical mastitis than that the negative group. This result is similar to the result of Seker.

However, this result is not consistent with knowledge that the higher teat length is the risk factor for sub-clinical mastitis. In this study, insignificant differences of teat length between mastitis groups could be that the teat length means were intermediate according to the classification of World Holstein-Friesian federation. It was determined that there were significant differences between positive and negative mastitis groups with regard to teat height ($p<0.05$) and the mean values of teat height were in negative group than that positive group. It confirms that the udder infection risk decrease with increasing the teat height.

Lactation milk yield, mature age corrected milk yield, 305 days corrected milk yield values were higher in positive mastitis group than that negative group although, the differences between groups were statistically insignificant suggesting that cows with high milk production suffered more infections. This finding is similar with the report of Yamazaki *et al.* (2009). In the study, there were no statistically significant differences between wither height, hip height, chest girth and sub-clinical mastitis groups.

In the study, generally, determination of insignificant differences between teat measurements and milk yield was similar to the previously published results (Bardakcioglu *et al*., 2004). However, Tilki *et al.* (2005) determined that teat length had significant effect on milk yield and 305 days milk yield decreased with increasing rear teat length of Brown Swiss cows. The significant differences were determined with regard to wither height, hip height and chest girth between milk yield groups. The mean values of these traits were higher in the high milk yield group. This result was similar to the results of Bardakcioglu *et al.* (2004).

CONCLUSION

As a result, it is said that Holstein cows with higher mean wither height, hip height and chest girth had more milk yield. However, body traits and milk yield had no effect on the sub-clinical mastitis while some teat measurements had significant effect. Further research would be useful to determine the relation between milk yield and subclinic mastitis.

REFERENCES

Bardakcioglu, H.E., M.K. Turkyilmaz and A. Nazligul, 2004. The relationship between milk production and some udder and body measurements in Holstein cows. Indian Vet. J., 81: 67-71.

Heinrichs, A.J. and G.L. Hargrove, 1987. Standards of weight and height for Holstein heifers. J. Dairy Sci., 70: 653-660.

Lin, C.Y., A.J. Lee, A.J. McAllister, T.R. Batra and G.L. Roy *et al.*, 1987. Intercorrelations among milk production traits and body and udder measurements in Holstein heifers. J. Dairy Sci., 70: 2385-2393.

National Mastitis Council, 1996. Current Concepts of Bovine Mastitis. 4th Edn., National Mastitis Council, Madison, WI., USA.

Tilki, M., S. Inal, M. Colak and M. Garip, 2005. Relationship between milk yield and udder measurements in Brown Swiss cows. Turk. J. Vet. Anim. Sci., 29: 75-81.

Yamazaki, T., H. Takeda, A. Nýshýura and K. Togashi, 2009. Relationship between the lactation curve and udder disease incidence in different lactation stages in first-lactation Holstein cows. Anim. Sci. J., 80: 636-643.