Investigations on the Conformation Traits, Herd Life and Milk Yield in Holstein Cows

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S U M M A R Y

In this study, the relations between conformation traits, herd life and milk yield in Holstein cows were investigated. The material of this study was formed by 247 head Holstein cows in Polatli State Farm and 47 head Holstein cows in Ankara University Agricultural Faculty Research Application Farm. In this study, seventeen linear type traits on a scale of 1 to 9, and 4 general traits on a scale of 65 to 100 were scored in a total of 294 head Holstein cows. Stature was measured by a measuring cane. The relations between traits were investigated by Spearman's rho coefficient. The best regression equation estimating 305-day milk yield was determined by Stepwise Linear Regression Analysis. The mean values of 305 day milk yield in Ankara University Agricultural Faculty Research Application Farm and Polatli State Farm were ranged between 4862-6559 kg and 6908-7847 kg, respectively. The positive and significant correlations were found between conformation traits and 305-day milk yield in two farms. These correlations indicate that an increase in 305-day milk yield could be achieved through selection on any of the conformation traits. The mean Total score values of Holstein cows that were grown up in Ankara University Agricultural Faculty Research and Application Farm and Polatli State Farm were ranged between 76.1-76.7 and 77.2-78.0, respectively, and cows in both enterprises were classified as medium class. The positive and significant correlations between the final score and categorical type traits constituted showed that an improvement could be seen in the categorical type traits by selection on final score.

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Siyah Alaca İneklerde Dış Yapı Özellikleri, Sürüde Kalma Süresi ve Süt Verimi Üzerine Araştırmalar

Ö Z E T

Bu çalışmada, Siyah Alaca ineklerde dış yapı özellikleri, sürüde kalma süresi ve süt verimi arasındaki ilişkiler incelenmiştir. Çalışmanın materyalini Ankara Üniversitesi Ziraat Fakültesi Araştırma Uygulama Çiftliği'nde yetiştirilen 47 baş ve Polatlı Tarım İşletmesi'nde yetiştirilen 247 baş olmak üzere toplam 294 baş Siyah Alaca inek oluşturmuştur. Çalışmada, toplam 294 baş Siyah Alaca inekte 17 doğrusal özellik 1-9 puanlık skalada ve 4 genel özellik ise 65-100 puanlık bir skalada puanlanmıştır. Sağrı yüksekliği ölçü bastonu ile ölçülmüştür. Özellikler ile süt verimi arasındaki ilişkilerin incelenmesinde Sperman'ın rho katsayısından yararlanılmıştır. 305 günlük süt verimini en iyi şekilde tahmine imkan verecek regresyon denklemini elde etmek için Aşamalı Doğrusal Regresyon Analizi (Stepwise Linear Regression Analysis) yaklaşımından yararlanılmıştır. Ankara Üniversitesi Araştırma Uygulama Çiftliği'nde 305 gün süt verimine ait ortalamalar 4862 ile 6559 kg, Polatlı Tarım İşletmesi'nde ise 6908 ile 7847 kg arasında değişmektedir. Her iki işletmede 305 günlük süt verimi ile bazı dış yapı özellikleri arasında pozitif ve önemli korelasyonlar tespit edilmiş olup bunlar; dış yapı özelliklerinden herhangi birine dayanan seleksiyonla süt veriminde de artış sağlanabileceğini gösterir. Ankara Üniversitesi Araştırma Uygulama Çiftliği ve Polatlı Tarım İşletmesi'nde yetiştirilen Siyah Alaca ineklere ait Toplam puan ortalamaları sırasıyla; 76.1-76.7 ile 77.2-78.0 arasında değişmekte olup, her iki işletmedeki hayvanlar da orta sınıfa girmektedir. Araştırma sonuçları, her iki işletmede de toplam dış yapı puanı ile bunu meydana getiren ana dış yapı özellikleri arasındaki pozitif ve önemli olan ilişkilerden dolayı, toplam dış yapıya göre yapılan seleksiyonla ana dış yapı özelliklerinde de iyileşme olabileceğini göstermektedir.

INTRODUCTION

One of the most important factors influencing profit in dairy cattle breeding is the status of cows with high yield and continuation of this high yield in long term. The bodies and constitution of cows should become appropriate for continuation of high yield for long terms.

According to ICAR Guidelines, a complete linear scoring system valuable for a given breed may often includes further items such as skeletal traits, udder, and legs etc. Linear scoring may be conducted on dairy cattle. Linear scoring has the Linear Type Traits. The Linear Type Traits were classified on a scale of 1 to 9 points for Linear Type Traits. One to 15 point scales is recommended in such circumstances.[1] These points are stature (S), chest width (CW), body depth (BD), dairy character (DC), rump angle (RA), rump width (RW), rear leg set (RLS), rear leg angle (RLA), foot diagonal (FD), fore udder attachment (FUA), rear udder height (RUH), central ligament (CL), udder depth (UD), rear udder teat placement (RUTP) and udder teat length (UTL). Additionally these 15 character knee structure (KS) and fore udder teat placements (FUTP) are commonly used in Turkey and consequently character numbers are 17 at linear scoring.[2]

The other characters that are outside of linear type traits were called as 'General Traits'. It was suggested that points from 50 to 97 given to cows that were evaluated in terms of this characters by ICAR. Herein apart from Linear scoring, desirable circumstances are predicated on rather than actual circumstances. Namely, cows were given points for body structure (BS), dairy type (DT), foot-leg structure (FLS) and udder structure (US). The means of points were determined as follows; 90-97 perfect, 85-89 very good, 80-84 good, 75-79 intermediate and 50-74 adequate.[3]

As being understood from the information given to date, evaluation of cows must be taken into account together with conformation traits and milk yields.

MATERIALS and METHODS

A total of 247 head Holstein cows in Polatli State Farm (PSF) and 47 head Holstein cows in Ankara University Agricultural Faculty Research Application Farm (AUF) constituted the material of this study. In the present study, seventeen linear type traits on a scale of 1 to 9, and 4 general traits on a scale of 65 to 100 were scored in a total of 294 head Holstein cows. Stature was measured by a measuring cane. The relations between traits were investigated by Spearman's rho coefficient.[4] The best regression equation estimating 305-day milk yield was determined by Stepwise Linear Regression Analysis.[5]

Researcher was attended to a classification course managed by The Cattle Breeder's Association of Turkey before starting to classification of the work. The presenting author achieved 'Classification Expert Certificate'. Then, every farm's data were investigated cows were determined 1st-5th months of lactation. Cow's identification numbers, lactation numbers and late calving date were recorded from farm's recognizing. Firstly cows were carried out within Linear Scoring for 17 characters and then body structure, dairy type, foot-leg structure and udder structure on a scale of 65 to 100 were scored for all cows. The Means and Minimum and Maximum Value of Linear Scoring of Linear Type Traits for Holstein –Friesian were given in Table 1.[6]

The scoring and measurement were started on 3 March 2004. The investigation was completed in Ankara University Agricultural Faculty Research Application Farm on 1 July 2005 and in Polatli State Farm on 4 July 2005.

According to evaluation predicated on points for 4 general traits (BS, DT, FLS, US), it was mentioned that those characters effect on milk yield. The model of this aim was given below (Model 1). In addition, a separate model was composed for total score value (TS) that was calculated from general traits effects on 305-day milk yields (Model 2).

Model 1

$$Y_{ijkl} = \mu + s_i + bm_j + ls_k + b_{yx}. X_{ijkl} + b_{yz}. Z_{ijkl} + b_{yg}. G_{ijkl} + b_{yh}. H_{ijkl} + e_{ijkl}$$

Model 2

$$Y_{ijkl} = \mu + s_i + bm_j + ls_k + b_{yo} O_{ijkl} + e_{ijkl}$$

Where; Y_{ijkl}: i. farm, j. calving month, k. lactation number, l. cow's 305-day lactation milk yield, μ : population mean, s_i : i. farm's effect (i: 1, 2), bm_j : j. calving month's effect (j: 1, 2,….12), ls_k: k. lactation number's effect (k: 1, 2, 3, 4, 5, ≥ 6), X_{ijkl} : i. farm, j. calving month, k. lactation number, l. cow's dairy type score, Z_{ijkl} : i. farm, j. calving month, k. lactation number, l. cow's body structure score, G_{ijkl}: i. farm, j. calving month, k. lactation number, l. cow's foot and leg structure score, H_{ijkl} : i. farm, j. calving month, k. lactation number, l. cow's udder structure score, O_{ijkl}: i. farm, j. calving month, k. lactation number, l. cow's total score, b_{yx} : partial regression coefficient with regard to dairy type of milk yield, b_{yz}: partial regression coefficient with regard to body structure of milk yield, b_{yg}: partial regression coefficient with regard to foot and leg structure of milk yield, b_{yh}: partial regression coefficient

with regard to udder structure of milk yield, b_{yo}: partial regression coefficient with regard to total point of milk yield, e_{ijklm}: residual error.

According to the evaluation predicated on points for linear type traits (17 characters), it was mentioned that those characters effect on milk yield. The model of this aim was given below (Model 3 and Model 4).

The Effects on 305-Day Milk Yield of Linear Type Traits

Model 3

$Y_{ijklm} = \mu + s_i + bm_j + ls_k + DÖ1n + b_{ny} N_{ijklm} + e_{ijklm}$
Model 4: $Y_{ijklm} = \mu + s_i + b_{mj} + ls_k + DÖ16n + b_{ny} N_{ijklm} + + e_{ijklm}$

Where; Y_{ijklm}: i. farm, j. calving month, k. lactation number, l. classified in linear type traits, m. cow's 305-day lactation milk yield, μ : Population mean, s_i : i. farm's effect (i: 1, 2), bm_j : j. calving month's effect (j: 1, 2,....12), ls_k: k. lactation number's effect (k: 1, 2, 3, 4, 5, $\geq$ 6), N_{ijklm} : i. farm, j. calving month, k. lactation number, l. classified in linear type traits, m. cow's stature, bny : partial regression coefficient with S of milk yield, $DÖ1n$: effect of DC class, (n: 1, 2,..,5), $DÖ2n$: effect of BD class (n: 1, 2, 3, 4), $DÖ3n$: effect of CW class (n: 1, 2, 3, 4), $DÖ4n$: effect of RW class (n: 1, 2, 3, 4), $DÖ5n$: effect of RA class (n: 1, 2, 3, 4), $DÖ6n$: effect of RLA class (n: 1, 2, 3), $DÖ7n$: effect of FD class (n: 1, 2, 3, 4), $DÖ8n$: effect of KS class (n: 1, 2, 3, 4, 5), $DÖ9n$: effect of RLS class (n: 1, 2, 3,....8), $DÖ10n$: effect of FUA class (n: 1, 2, 3, 4), $DÖ11n$: effect of RUH class (n: 1, 2, 3, 4, 5), $DÖ12n$: effect of CL class (n: 1, 2, 3, 4, 5, 6), $DÖ13n$: effect of UD class (n: 1, 2, 3, 4, 5), $DÖ14n$: effect of FUTP class (n: 1, 2, 3, 4), $DÖ15n$: effect of FUTL class (n: 1, 2, 3, 4, 5), $DÖ16n$: effect of RUTP class (n: 1, 2, 3,....9), e_{ijklmn}: Residual error.

RESULTS

Ankara University Agricultural Faculty Research Application Farm (AUF) and Polatli State Farm (PSF) were given mean of 305-day milk yields are from 4862 to 6559 kg in AUF and from 6908 to 7847 in PSF in Table 2.

The mean values of general traits were changed from 65 to 85 in AUF and from 64 to 89 in PSF. The mean Total score valued (for general traits) were found as 76.1-76.7 and 77.2-78.0 for AUF and PSF, respectively. According to the results, cows grown in each farms were classified in the middle class.

The effects of general traits on 305-day milk yield were found non-significant ($p>0.01$) and only effect of dairy type (DT) was found significant (P< 0.01). Furthermore, the differences between mean value of 305-day milk yield for farms and lactation numbers were found significant ($p<0.01$).

The effects of DC-RUH ($p<0.01$) and CW-RLS ($p<0.05$) on 305-day milk yield were found significant, when the effects of linear type traits on 305-day milk yield were analyzed.

The correlations were changed from -0,12 (between 305-day milk yield and central ligament) to 0,26 (between 305-day milk yield and stature) between 305-day milk yield and linear type traits and were found non-significant at AUF ($p>0.05$) (Table 3). The correlations were changed from -0,11 (between 305-day milk yield and fore udder attachment) to 0,26 (between 305-day milk yield and stature) and were found significant at PSF ($p<0.01$) (Table 3).

The highest correlations were found between FUA and UD at AUF and PSF, were estimated as 0,77 and 0,76, respectively, and was found significant (P<0.01). The lowest correlations were found -0,34 at AUF (between RUH and RLS), were found -0,33 at PSF (between UD and BD) (Table 4 and Table 5).

The correlations were found high among DT, B, FLS, US and TP and were found significant at AUF ($p<0.01$). The same results were found in PSF ($p<0.01$) (Table 4 and Table 5). These correlations indicate that an increase in 305-day milk yield could be achieved through selection on any of the conformation traits.

The best regression equation estimating 305-day milk yield was determined by Stepwise Linear Regression Analysis. Dairy character, stature, dairy type, rump width, rear udder height and rear leg set were included for the most suitable model. Consequently, the most high R^2 value was found 18,95 % at AUF and 17,06 % at PSF.

Throughout the study period, as no animal from PSF were separated form the herd, we were unable to detect the remaining duration of the animals in the herd. In AUF regarding slaughtering, manner of dying, and to be sold 12 head cows were remained out of the herd and to those of animals, the remaining duration in the herd was detected as 63.9 ±7.14 months (minimum: 31 months, maximum: 121.7 months).

DISCUSSION

According to analyses, differences between lactations were non-significant in each farm ($p> 0.05$). In many of the studies reported that the highest 305-day milk yield of cows were reached 5 th and 6th.[7]

The correlations between traits and 305-day milk yield obtained in this study were closely related with some of the researchers results[8,9,10,11] whereas were lower in contrast to some others.[12]

The correlations between traits obtained in this study were closely related with some of the researcher results,[13] whereas were higher in contrast to some others.[8]

The remaining duration in the herd obtained in this study were higher in contrast to some others[14] (2.8-3.4 year), whereas were closely related with some of the prior researcher result[15] (2073 days) ■■■

Table.1. The Means and Minimum and Maximum Value of Linear Scoring of Linear Type Traits for Holstein –Friesian.[4]
Çizelge 1. *Siyah Alaca ırkı için doğrusal tanımlamada ele alınan her bir özellikte en düşük ve en yüksek puanların anlamı ile ideal sayılan puanlar.[4]*

Linear Type Traits	Min (1)	Max (9)	Ideal
Stature cm	Very low (1.30 cm)	Very high (1.54 cm)	145
Dairy Character	Very rough, wide	Very narrow, sharp	7-9
Body Depth	Very short	Very deep	7
Chest Width	Very narrow	Very wide.	9
Rump Width	Very narrow	Very wide.	7-9
Rump Angle	Elevating	Very lowering	5
Rear Leg Angle	Very plumb	Very narrow	5
Foot Diagonal	Very low	Very high	9
Knee Structure	Very rough	Very dry	9
Rear Leg Set	Closed knees	Parallel	5-9
Fore Udder Attachment	Very weak	Very strong	7-9
Rear Udder Height	Very low	Very high	9
Central Ligament	Very weak	Very strong	9
Udder Depth	Very low	Very high	5
Fore Udder Teat Placement	External lob	Internal lob	6
Fore Udder Teat Length	Very short	Very long	5
Rear Udder Teat Placement	Very open	Very adjacent	5

Table 2. The mean values of 305-day milk yields of cows in Ankara University Agricultural Faculty Research Application Farm and Polatlı State Farm ()
Çizelge 2. *Ankara Üniversitesi Ziraat Fakültesi Araştırma Uygulama Çiftliği ile Polatlı Tarım İşletmesindeki İneklerin 305 Günlük Süt Verimi Ortalamaları.*

FARM	Ankara University Agricultural Faculty Research Application Farm				Polatlı State Farm			
LS	n	$\bar{X} \pm S_X$	Min	Max	n	$\bar{X} \pm S_X$	Min	Max
1	10	4862 ± 715	2112	9455	36	6908 ± 279	2293	9950
2	4	5218 ± 1188	2735	7955	47	7617 ± 265	2354	11409
3	16	6559 ± 486	4083	10093	43	7730 ± 321	2992	11092
4	17	5427 ± 405	2644	9142	41	7742 ± 338	2800	10956
5	-	-	-	-	54	7847 ± 188	4724	10108
6	-	-	-	-	26	6988 ± 401	3639	12419

Table 3. The correlations between traits and 305-day milk yield for Ankara University Agricultural Faculty Research Application Farm and Polatlı State Farm.
Çizelge 3. *Ankara Üniversitesi Ziraat Fakültesi Araştırma Uygulama Çiftliği ile Polatlı Tarım İşletmesindeki İneklerin 305 Günlük Süt Verimi ile Özellikler Arasındaki Korelasyonlar.*

FARMS	Ankara University Agricultural Faculty Research Application Farm	Polatlı State Farm
Traits	Correlations	Correlations
S	0.26	0.26**
DC	-0.11	0.19**
BD	0.10	0.11
CW	-0.06	0.009
RW	0.02	-0.03
RA	0.15	0.03
RLA	0.07	0.01
FD	0.23	-0.06
KS	0.03	-0.01
RLS	0.08	0.07
FUA	0.08	-0.11
RUH	0.03	0.12
CL	-0.12	0.007
UD	-0.06	-0.10
FUTP	0.21	-0.04
FUTL	0.10	0.05
RUTP	0.05	-0.08
DT	0.01	0.21**
BS	0.22	0.03
FLS	0.08	0.008
US	0.12	-0.07
TS	0.13	0.05

*: p<0.05, ** p<0.001, **TS**: Total score, **S**: Stature, **DC**: Dairy character, **BD**: Body depth, **CW**: Chest width, **RW**: Rump width, **RA**: Rump angle, **FD**: Food diagonal, **RLA**: Rear leg angle, **KS**: Knee structure, **RLS**: Rear leg set, **FUA**: Fore udder attachment, **RUH**: Rear udder height, **CL**: Central ligament, **UD**: Udder depth, **FUTP**: Fore udder teat placement, **FUTL:** Fore udder teat length, **RUTP**: Rear udder teat placement, **DT**: Dairy type, **BS**: Body structure, **FLS:** Food-leg structure, **US**: Udder structure

Table 4. The Correlations Between Linear Type Traits and General Traits at Ankara University Agricultural Faculty Research Application Farm
Çizelge 4. Ankara Üniversitesi Ziraat Fakültesi Araştırma ve Uygulama Çiftliğinde Doğrusal Tanımlama Kapsamındaki Özellikler ile Puanlama Özellikleri Arasındaki Korelasyonlar

Traits	S	DC	BD	CW	RW	RA	RLA	FD	KS	RLS	FUA	RUH	CL	UD	FUTP	ÖMBU	RUTP	DT	BS	FLS	US
S																					
DC	0.36*																				
BD	0.22	-0.02																			
CW	0.10	-0.05	0.23																		
RW	-0.06	-0.23	0.16	0.19																	
RA	0.10	0.06	-0.03	-0.15	-0.07																
RLA	0.11	-0.01	-0.08	0.168	0.14	0.09															
FD	0.05	0.09	0.19	0.00	-0.02	0.17	0.15														
KS	0.33	0.01	-0.18	-0.16	-0.30*	0.18	-0.02	0.11													
RLS	-0.10	0.08	0.23	-0.02	-0.14	-0.21	-0.18	0.04	0.13												
FUA	0.07	-0.11	0.01	0.35*	0.004	-0.14	-0.07	-0.09	0.29*	-0.002											
RUH	0.16	-0.13	0.009	-0.16	-0.06	0.31*	0.06	0.12	0.02	-0.34*	-0.05										
CL	0.07	0.14	0.34*	0.22	-0.18	-0.10	-0.13	-0.17	0.14	0.13	0.20	0.06									
UD	-0.07	0.02	-0.11	0.24	0.07	-0.17	-0.08	-0.12	0.08	0.03	0.77**	-0.17	0.11								
FUTP	0.18	-0.007	0.10	0.33*	0.19	-0.18	0.29*	0.20	0.13	0.12	0.37**	0.05	0.19	0.39**							
ÖMBU	0.14	-0.14	0.009	-0.18	-0.05	0.14	0.21	0.15	0.04	-0.05	-0.01	0.22	0.30*	-0.15	-0.01						
RUTP	0.28	0.29*	0.19	0.11	-0.07	0.13	0.04	0.02	0.21	0.01	0.24	0.32*	0.70**	0.16	0.43	-0.10					
DT	0.51**	0.84**	-0.08	-0.005	-0.21	0.15	-0.07	0.11	0.03	-0.05	-0.05	0.47	0.13	0.02	0.09	-0.17	0.30*				
BS	0.49**	-0.04	0.38**	0.28	0.20	0.22	0.20	0.14	-0.12	-0.11	-0.03	0.44**	-0.07	-0.23	0.22	0.22	0.04	0.16			
FLS	0.29*	0.15	0.15	-0.10	-0.23	-0.05	0.01	0.22	0.30*	0.50**	-0.006	0.17	0.03	-0.24	0.19	0.18	0.09	0.23	0.38**		
US	0.45**	0.06	0.002	-0.03	-0.08	0.17	0.16	-0.05	0.22	-0.10	0.34*	0.47**	0.35*	0.20	0.41**	0.18	0.57**	0.24	0.35*	0.37**	
TS	0.62**	0.31*	0.14*	0.04	-0.09	0.15	0.05	0.08	0.19	0.08	0.19	0.39*	0.23	0.01	0.34*	0.12	0.41*	0.52**	0.60*	0.69*	0.81*

*: $p<0.05$, ** $p<0.01$, **TS**: Total score, **S**: Stature, **DC**: Dairy character, **BD**: Body depth, **CW**: Chest width, **RW**: Rump width, **RA**: Rump angle, **FD**: Food diagonal, **RLA**: Rear leg angle, **KS**: Knee structure, **RLS**: Rear leg set, **FUA**: Fore udder attachment, **RUH**: Rear udder height, **CL**: Central ligament, **UD**: Udder depth, **FUTP**: Fore udder teat placement, **FUTL**: Fore udder teat length, **RUTP**: Rear udder teat placement, **DT**: Dairy type, **BS**: Body structure, **FLS**: Food-leg structure, **US**: Udder structure

Table 5. The Correlations Between Linear Type Traits and General Traits at Polatli State Farm
Çizelge 5. Polatlı Tarım İşletmesi'nde Doğrusal Tanımlama Kapsamındaki Özellikler ile Puanlama Özellikleri Arasındaki Korelasyonlar

Traits	S	DC	BD	CW	RW	RA	RLA	FD	KS	RLS	FUA	RUH	CL	UD	FUTP	ÖMBU	RUTP	DT	BS	FLS	US
S																					
DC	-0.03																				
BD	0.30**	-0.06																			
CW	-0.01	-0.25**	0.19**																		
RW	0.19**	-0.17**	0.03	0.05																	
RA	0.32**	0.008	-0.03	-0.08	0.17**																
RLA	0.04	-0.007	-0.005	0.09	0.31**	0.04															
FD	-0.005	-0.17**	0.12	0.07	0.04	-0.01	-0.02														
KS	-0.02	0.23**	-0.02	-0.15*	-0.03	0.04	-0.12	0.04													
RLS	-0.10	0.02	-0.11	-0.002	-0.05	-0.06	-0.17**	0.01	0.10												
FUA	-0.12*	-0.16*	-0.25**	-0.03	0.14*	-0.13*	0.16**	-0.02	-0.01	0.04											
RUH	0.05	0.03	-0.06	-0.06	0.20**	0.02	0.13*	-0.08	-0.10	0.09	0.22**										
CL	-0.01	-0.03	-0.07	-0.05	0.04	-0.07	0.04	-0.06	0.08	0.12*	0.38**	-0.01									
UD	-0.06	-0.08	-0.33**	0.02	0.000	-0.07	0.15*	-0.08	-0.03	0.08	0.76**	0.17**	0.38**								
FUTP	-0.01	0.06	0.02	-0.05	-0.14*	-0.15*	-0.05	-0.03	-0.01	0.03	0.19**	-0.04	0.17**	0.23**							
ÖMBU	0.001	0.02	0.09	-0.02	-0.18**	0.08	-0.07	0.001	0.08	0.03	-0.18**	-0.17**	-0.18**	-0.12	0.09						
RUTP	-0.02	0.009	0.03	-0.02	-0.04	-0.09	0.07	-0.05	0.009	0.03	0.34**	0.01	0.69**	0.36**	0.36**	-0.20**					
DT	-0.003	0.93**	-0.02	-0.22**	-0.08	0.02	0.05	0.15*	0.24*	-0.01	-0.11	0.05	0.02	-0.07	0.06	0.006	0.02				
BS	0.25''	-0.01	0.14*	0.10	0.30**	0.63**	0.11	0.08	-0.08	-0.02	0.00	0.12	0.003	-0.05	-0.07	0.09	-0.01	0.03			
FLS	0.001	0.001	-0.08	-0.03	0.02	0.08	0.09	0.10	0.32*	0.42*	0.021	-0.004	0.06	0.05	-0.06	0.04	0.01	0.03	-0.01		
US	-0.07	-0.08	0.007	-0.04	0.08	-0.05	0.19**	0.01	-0.05	-0.01	0.47**	0.20**	0.31**	0.39**	0.24**	0.12	0.46**	-0.06	0.02	0.12	
TS	0.01	0.13**	0.07	-0.10	0.08	0.15*	0.15*	0.04	0.21*	0.13*	0.25**	0.19**	0.23**	0.20**	0.13*	0.13*	0.30	0.46**	0.29**	0.45**	0.68**

*: p<0.05, ** p<0.001, **TS**: Total score, **S**: Stature, **DC**: Dairy character, **BD**: Body depth, **CW**: Chest width, **RW**: Rump width, **RA**: Rump angle, **FD**: Food diagonal, **RLA**: Rear leg angle, **KS**: Knee structure, **RLS**: Rear leg set, **FUA**: Fore udder attachment, **RUH**: Rear udder height, **CL**: Central ligament, **UD**: Udder depth, **FUTP**: Fore udder teat placement, **FUTL**: Fore udder teat length, **RUTP**: Rear udder teat placement, **DT**: Dairy type, **BS**: Body structure, **FLS**: Food-leg structure, **US**: Udder structure.

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