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CORRELATION BETWEEN UDDER CONFORMATION WITH DAILY MILK YIELD OF BUFFALOES

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Abstract: The study field was conducted to correlate milk yield with the udder dimensions of buffaloes, during lactate season 2019, a total of 72 lactating buffaloes (Bubalus bubalis) were chosen randomly from Baghdad (25 female) and Al-Muthanna province (47 female) (270km south of Baghdad). Parameters such as front teat length (FTL), front teat diameter (FTD), the distance between front teats (FTDIS), rear teat length (RTL), rear teat diameter (RTD), the distance between rear teats (RTDIS), the distance between the front and rear teats (FRDIS) and daily milk Yield (DMY) were calculated. Correlation coefficients between various udder measurements (FTL, FTDIS, RTDIS, and FRDIS) with DMY were positive and highly significant (P≤0.01). On the other hand, FTD, RTL, and RTD showed a non-significant correlation with DMY. We conclude from this study that udder measurements could be taken into account in buffalo improvement programs.

Keywords: Buffaloes, Udder Measurements, Milk Production, Phenotypic Correlations.

1. Introduction

The Iraqi buffalo is identified by its excellent ability to adapt in various environmental situations and notable longevity (up to 10 Seasons production period), as well as its high performance in availing from low quality feed such as cane and sedge obtainable in its areas, which participate to preserving it from the threat of annihilation in Iraq [1], [2]. Water buffalo husbandry does not demand high investment because they are undemanding in terms of feed and shelter, with its perfect flavor and good qualities, buffalo milk can be used to spread the range of dairy products [3].

Selection is vital tool to improve and promote the productive prospective. In order to evaluate the milking efficiency of animals, first site that animal breeder is looking for is udder [4]. In general, the purpose of the most selection programs in dairy cows is to increase milk yield, that why the udder plays main role in this programs [5]. If the data are not available, livestock holders used to find the relation between udder measurements and milk yield as a suitable selection tool [6].

Many reports showed that udder conformation traits could play an important role as selection criteria in dairy animals [7]. Positive and significant correlation was found in Holstein cows between teat diameter and daily milk yield [8] and udder measurements were correlated positively and significant with milk yield [9]. The

association between various teat measurements and daily milk yield were positive and significantly correlated [10]. Udder measurements and milk production was correlated positively [11].

2. Materials and Methods

Location of the study: Seventy-two adult lactating buffaloes (Bubalus bubalis) were chosen randomly from Baghdad province (25 female) and (47 female) from AL- Muthanna province (270km south of Baghdad) during one lactating season 2018/2019. Milk yield and some of the standard udder measurements were recorded. Udder measurements include teat length (TL), teat diameter (TD) and teat distance (TDIS) [6].

Daily milk yield: Daily milk yield (DMY) was collected from individual animals every two weeks. Dams were hand-milked and milk yield was recorded after complete milking. The day milk yield was recorded by measuring the quantity of milk present in the milking pail, after completion of milking operation.

Udder measurements:

1. Teat length (TL): was taken from the upper part of the teat, where it hangs perpendicularly from the udder to the tip of the teat using vernier Caliper.
2. Teat diameter (TD): was measured using vernier caliper at the middle of the teat.
3. Teat distance (TDIS): was taken between fore teats, rear teats and the distance between fore and rear teats.

Statistical analysis: The mean and standard error estimates of udder measurements and (DMY) were achieved. The Pearson's Correlation between udder measurements with (DMY) was specified [12].

3. Results and Discussion

The mean±S.D values of FTL, FTD, FTDIS, RTL, RTD, RTDIS, FRDIS and DMY were 4.8±0.9cm, 3.0±0.1cm, 10.6±2.2cm, 7.8±0.9cm, 4.2±0.3cm, 5.7±2.2cm, 5.3±2.0cm and 7.0±3.0 (Liters) respectively as in table(1).Correlation coefficient among udder measurements is shown in table (2), positive and highly significant (P≤0.01) correlations were found among FTL with FTDIS and RTDIS, FTD with RTD, FTDIS with RTDIS, RTL with RTD and RTDIS with FRDIS. On the other hand, correlation coefficients observed among FTDIS with RTL and FRDIS, RTD with RTDIS were positive and significant at the level (P≤0.05). Whereas association among other udder measurements was found non-significant. The only negative and non-significant correlation was found between FTL with RTD.

Table 1. Mean ± S.D and range of various udder Measurements and daily milk yield.

Parameters	No. of Animals	Mean(cm)±S.D	Range
FTL	72	4.8±0.9	3.8 - 6.3
FTD	72	3.0±0.1	2.8 - 3.6
FTDIS	72	10.6±2.2	6.5 - 14.0
RTL	72	7.8±0.9	5.7 - 10.0
RTD	72	4.2±0.3	3.5 - 5.0
RTDIS	72	5.7±2.2	2.0 - 10.0
FRDIS	72	5.3±2.0	3.0 -13.5
DMY	72	7.0±3.0	3.0 - 14.0

S.D = standard deviation, FTL= front teat length, FTD = front teat diameter, FTDIS = distance between front teats, RTL= rear teat length, RTD = rear teat diameter, RTDIS = distance between rear teats, FRDIS = distance between front and rear teats, (DMY) = Daily milk yield.

As shown in table (3) the correlation coefficient between various udder measurements (FTL, FTDIS, RTDIS and FRDIS) with DMY were positive and highly significant (P≤0.01). As regards to TL this finding was in conformity with [11]. A previous study reported positive and significant (P≤0.05) correlation for FTDIS with DMY [5]. In present study FTD, RTL and RTD were found to have a non-significant correlation with DMY. This result was in agreement with [6].Table (4) showed highly significant (P≤0.01) correlation for Protein % with FTL and FTDIS, negative significant (P≤0.05) relation with RTD, negative non-significant correlation with FTD and RTL,

and non-significant correlation with RTDIS and FRDIS, [13] stated that there is non-significant correlation was found between milk composition and mammary conformation. Further, Fat% expressed a negative highly significant (P≤0.01) correlation with FTL, non-significant with RTL, RTD and RTDIS, and negative non-significant correlation with FTD, FTDIS and FRDIS, which was in agreement with findings of [14].

Table 2. Correlation coefficient among udder measurements.

Parameters	FTL	FTD	FTDIS	RTL	RTD	RTDIS	FRDIS
FTL	1	0.06NS	O.62**	0.01NS	-0.19NS	0.31**	0.21NS
FTD		1	0.12NS	0.10NS	0.40**	0.21NS	O.11NS
FTDIS			1	0.26*	0.14NS	0.61**	0.24*
RTL				1	0.47**	0.17NS	0.21NS
RTD					1	0.24*	0.21NS
RTDIS						1	0.58**
FRDIS							1
*** Significant at P≤ 0.05 ** Significant at P≤ 0.01, NS: Non-Significant**							

FTL= front teat length, FTD= front teat diameter, FTDIS= distance between front teats, RTL= rear teat length, RTD= rear teat diameter, RTDIS= distance between rear teats, FRDIS= distance between front and rear teats.

Table 3. Correlation coefficient between Udder measurements and daily milk yield.

Parameters	Correlation coefficient-r with DMY	Level of Sig.
Front teat length-FTL	0.36	**
Front teat diameter-FTD	0.11	NS
Teat distance front-FTDIS	0.41	**
Rear teat length-RTL	0.08	NS
Rear teat diameter-RTD	0.15	NS
Rear teat distance-RTDIS	0.49	**
Front and rear teat distance-FRDIS	0.39	**
**** Significant at P≤0.01, NS: Non-Significant.**		

(DMY) = Daily milk yield.

Table 4. Correlation coefficient between Udder dimensions and milk composition.

Parameters	Correlation coefficient-r			
	Protein (%)	Fat (%)	Lactose (%)	Sold non-fat (%)
Front teat length-FTL	0.74 **	-0.35 **	-0.48 **	-0.18 NS
Front teat diameter-FTD	-0.02 NS	-0.14 NS	-0.02 NS	-0.06 NS
Teat distance front-FTDIS	0.42 **	-0.03 NS	-0.27 *	0.05 NS
Rear teat length-RTL	-0.03 NS	0.20 NS	0.=03 NS	0.16 NS
Rear teat diameter-RTD	-0.25 *	0.02 NS	0.01 NS	0.25 *
Rear teat distance-RTDIS	0.09 NS	0.03 NS	-0.17 NS	0.23 *
Front and rear teat distance-FRDIS	0.04 NS	-0.11 NS	-0.04 NS	0.32 **
*** (P≤0.05), ** (P≤0.01), NS: Non-Significant.**				

Lactose % was found to have negative significant (P≤0.05) to negative highly significant (P≤0.01) relation with FTDIS and FTL respectively, negative non-significant correlation with FTD, RTDIS and FRDIS, and non-significant relation with RTL and RTD. SNF % expressed a positive significant correlation (P≤0.05) with RTD

and RTDIS to a highly significant (P≤0.01) relation with FRDIS, [15] had reported significant influence of mammary conformation on milk constituents. On the contrary, SNF % showed negative non-significant correlation with FTL and FTD, and non-significant relation with FTDIS and RTL.

4. Conclusions

The phenotypic association between various udder measurements traits and milk production were positive and highly significant. The RTDIS had the highest phenotypic association with daily milk yield (0.49). In the current study phenotypic correlations of udder measurements with milk yield indicate that selecting for the distance between rear teats (RTDIS), the distance between front teats (FTDIS), the distance between the front and rear teats (FRDIS), and front teat length (FTL) might improve the milk production of Iraqi buffaloes. Furthermore, these estimations could be utilized as indirect selection criteria for enhancing milk yield in Iraqi buffaloes beside the daily milk records. We conclude from this study that udder measurements could be taken into account in buffalo improvement programs.

Supplementary Materials:

No Supplementary Materials.

Author Contributions:

A. R. Alkhateeb and W. I. Ibrahim; methodology, writing—original draft preparation, A. A. E. Taha; writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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The authors declare no conflict of interest.

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