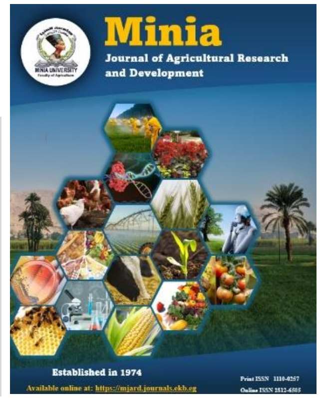
Minia J. of Agric. Res. & Develop., Minia Univ., Vol. 44 (3): 453 - 464, 2024

Minia Journal of Agricultural Research and Development

Journal homepage & Available online at:
https://mjard.journals.ekb.eg



Phenotypic performance and heritability of milk yield and its component traits of two types of Holstein German cattle

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ABSTRACT

In the current study, traits of milk yield (total milk yield: MY in Kg. and daily milk yield: DMY in Kg.) and its components such as fat percent (F%), fat yield in Kg (FY), protein percentage (P%), Protein yield (PY) in kg. and fat/protein ratio (F/P) were analyzed to evaluate the phenotypic performance and heritability in five parities of both black Holstein-Schwarzer Bunt Type: Sbt and red Holstein- Bunt Type: Rbt Germany cattle. The milk yield and its component traits showed high significant variation between the two German Holstein types and among different parities, as well as the interaction between them. It is clearly seen that the mean values of 4th lactation period for MY, DMY, F%, FY, P %, PY and F/P ratio were the highest among parities. Data of correlation between milk yield (MY) and its components showed negative correlation between the milk yield on one side and fat percent, protein percent and fat/ protein ratio on the other side, while positive correlation is found between milk yield in Kg. , fat and protein yield in Kg., in both Sbt and Rbt types. Data showed that except the milk protein yield in Kg., the heritability (H^2) values of all studied milk traits of Sbt are higher than those of Rbt type. Fat% exhibited the highest H2 values than those of almost all studied milk traits of both Sbt and Rbt, whereas the H^2 values of fat yield of both Sbt and Rbt are the lowest. It should be noted that H^2 values of milk protein percentage are relatively high.

Keywords: *correlation, Milk yield, milk components, heritability*

INTRODUCTION

Genetics and phenotypic performance are essential to make successful program in cattle breeding. Estimation of phenotypic and genetic parameters for milk yield and its components is a substantial tool for definition and evaluation of a quantitative character program that may be apply using selection or develop the management practices and/or both (**Tadesse, 2023**).

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Evaluations of phenotypic performance as well as the genetic estimates are very important because the management change increased the number and sizes of populations. For instance, evaluations of lactation yields were employed using 305-d yields analysis by **Voelker, (1981); Pander and Hill, (1993**), and **Olori and Galesloot, (1999)** in which they accumulated data from the linear interpolation of few weeks or months test day records. Predicted lactation yield (305-d) from TD records may represent the average of each cow production in the respective period, which may not always be the actual case (**Wiggans and Van Vleck, 1979; Shanks *et al.*, 1981; Anderson *et al.*, 1989 and Swalve, 1995**). Several studies suggested the correlation between milk yield and its components in one hand and changes in fertility and health accompanied with negative energy balance (NEB) at phenotypic level (**Kaufmann 1979; Grieve *et al.*, 1986; Butler and Smith, 1989; Loeffler *et al.*, 1999**). Likewise**, Friggens *et al.*, (2007)** used the measures of various milk compositions to predict EB in dairy cattle. They also suggested a reduced model with only 6 variables, including fat/protein ratio (FPR) , difference in fat/protein ratio (dFPR), daily milk (DIM), milk fat yield , lactose contents, fat/lactose ratios and interpreted about 94% of the variation in energy balance (EB) with only 0.071 MJ/d more in prediction error compared with a 25-variable model. Also, **Buttchereit *et al.*, (2011 and 2012)** suggested genetic correlation between FPR and EB and some health traits in Holstein's types. **Liu *et al.*, (2000)** recorded MY, fat, and protein % for all of the morning and evening milking in German Holsteins and found that use of evening milking was less accurately estimated yields than those of the morning milking.

Black-white type of Holstein cattle is controlled by completely dominant gene (B), while the red-white type (b) is recessive. Accordingly, Holstein were classified into two color forms (black: Sbt and red: Rbt). The heritability of such traits is a concept that calculates how much of the variation in a trait is due to the variation in genetic factors. However, this term is used to the resemblance between parents and their offspring **(Wray and Visscher, 2008)**. **Swalve (1995)** measured the genetic parameters in Friesian cows for milk yields, fat, and protein. For single test days, heritability values were highest for mid lactation yields which varied with the number of test day records included for each cow. Estimates of 0.32, 0.19, and 0.20 for yields of milk, fat, and protein, respectively, were the highest when only test d 3 to 7 were included; the corresponding estimates for 305-d records were 0.39, 0.32, and 0.30. The aim of the present study is to evaluate the phenotypic performance and heritability of milk yield and its components of both black and red Holstein Germany cattle (Holstein-Schwarzer Bunt Type, **Rbt** und Holstein-Rot Bunt Type, **Rbt**).

MATERIALS AND METHODS

Data of 7000 records of milk yield and its compositions were collected (United Information Systems for Animal Breeding, Kassel, Germany) for 1725 cows and 147 sires of both black (Sbt) and red (Rbt) Holstein color types of 190 farms in the period from 1999 to 2005 (more than five paritiess or parities). Records in the pedigree of German cattle were subjected for phenotypical performance analysis and genetic evaluation.

Milk yield (MY) and its composition traits

Milk yield and its component traits are test-day records of total milk yield (MY) in kg., daily milk yield (DMY) in kg., fat percent (F%), fat yield in Kg. (FY), protein percent (P%), protein yield in Kg (PY) and fat-to-protein ratio (FPR).

Statistical analysis:

Data were analyzed using Least Square Means (**LSM**) ± SD, General leaner model (**GLM**) procures, **SAS** program (2012). The analysis models were:

1-Factors affecting milk yield and its components traits:

$Y_{ijkl} = \mu + BT_i + L_j + F_k + (BT \times L)_{IJ} + e_{ijkl}$.

Where: Y_{ij}= ij^{th} Trait under study, μ = y_{ij}, General mean; BTi = effect of i^{th} Breed type 1= SBT and 2= RBT; L_j = effect of j^{th} lactation numbers from 1 to ≥ 5 ; F_k effect of k^{th} farm from 1 to 190 ; effect of ij^{th} interaction between breed type and Lactation numbers and eij= Random error. To detect the variances between the means, Duncan's Multiple Range test is used (Duncan, 1955). Pearson correlation coefficients were used to describe the relationship between milk yield and composition.

2- Heritability of milk yield and its component traits:

The following model was used for calculating heritability

$$H^{2 =} \ 4б^2_{S/} б^2_{S +} б^2_{w}$$

Where $б^2_S$ is the between sire variance $б^2_w$ is the within sire variance.

RESULTS AND DUSCUSSION

The least squares means ± stander error for the effects of two types of Holstein cattle, parity, the interaction between them, the farm on milk yield and its components are shown in Table (1).

All factors had significant (P<0.01 or P<0.05) effects on the milk yield and its composition. The results showed that the values of milk yield, daily milk yield, Fat%, Fat kg, protein%, protein kg and f/P ratio traits in Sbt Holestein type (8271.40, 26.68, 4.19, 347.43, 3.37 ,278.45 and 1.25) are greater than those of Rbt (7353.18, 23.72, 4.25, 300.86, 3.43 , 247.30 and 1.22, respectively).

Also, the effect of parity or number of lactation season was found to have a highly significant effect (P<0.01) on the studied traits. There is an increase in milk yield up to 4th parity and decline thereafter to 5 parity or more. Highest values of milk fat and protein percentages and F/P traits has been found in 1^{st} parity, the values were 4.36, 3.46 and 1.26, respectively. Conversely, the first parity had the lowest values of 23.21, 321.89, and 248.89 for milk yield, daily milk yield, fat and protein contents, respectively.

On the other hand, the highest values recorded for the studied traits were in 4^{th} parity, the values were 8681.14, 28.00, 342.80 and 286.55 for milk yield, daily milk yield, fat and protein contents, respectively. The lowest values of 4.21, 3.37, and 1.24 F/P ratio were calculated for milk yield, daily milk yield, fat, and protein contents, respectively.

The most popular and widespread breed in the world is the Black and White patterned Holstein-Friesian cattle. The breed is one of the highest producing dairy cattle breeds originated from the Holland and Friesland. Since 1965, German breeding has emphasized the Holstein-Friesian breed from Canada and the USA for milk production. Black and white or their red and white have become the preferred and attractive dairy breed in many countries because of high milk yield and low fat milk, which are necessary for human health.

The Holstein cow is known for its high milk production and production of all primary milk components, including fat, protein, and lactose. Milk yield and composition vary significantly among individuals within a breed. The cow's milk production increases with age or parity. This is caused by an increase in body weight (represent about 20% of the increasing in milk yield), which leads to a large changes in digestive system and subsequently more milk production from the mammary. Also, Recurring pregnancies and lactations (represent about 80% of the increasing in milk yield) are another cause for increased milk production with parity. Multiplying the yield of the first lactation by 1.3 can give an estimate of the mature yield.

A highly significant effects (P< 0.01) for interaction between two types of Holstein and parity (lactation number) have been founded the same trend for effect of type of Holstein and parity for different milk production and its components. It could be observed that the highest values for F%, P% and F/p ratio in 1st parity and lowest values for MY, DMY, fat and protein contents and vice versa in 4th parity. Moreover, the farm showed high significant effect (P<0.01) on all studied milk yield and composition traits. **Getahun (2018)** reported that the effect may be attributed to the breed or genetic makeup, management and production systems, climate change, reproductive technologies, and veterinary care. Non-genetic effect on dairy cattle product performance must be understood when making management and selection decisions (**Chrilukovian, 2006**). To alter the milk yield and composition through breeding programs, it is necessary to be knowledgeable about the relative influence of genetic and environmental factors that affect them.

Pearson correlation coefficients between milk yield and its constitutes of two types of Holstein breed are shown in Table (2). The values of correlation were ranged between - 0.55 for milk yield and protein percent in Sbt and 0.89 between milk yield and protein percent in Rbt and Sbt types.

Generally, Genetic factor account for 0.25 of the milk yield, while non-genetic factors (environmental factors) account for 0.75. In contrast, the percentage contents of milk fat and protein are influenced by around 0.60 of genetic factors and about 0.40 environmental factors. The best males and females are chosen for reproduction, and individual selection leads to the perfection of the animal. There is a strong correlation between the percentages of protein and fat. In contrast, milk yield and its constitutes percentages are negatively correlated. Thus, it is very difficult to improve milk yield and its milk composition percentages in the same time.

Table (1): mean values ± SD and Duncan's Multiple Range test for non-genetic factors (Holstein types: Sbt and Rbt, parity and the interaction between them) affecting milk production and its component traits.

Item	Milk yield	Daily milk yield	Fat%	Fat (kg)	Protein%	Protein (kg)	F/P Ratio
Type of Holstein	**	**	*	**	**	**	*
Sbt	8271.40 ± 561.55 a	26.68± 1.81 a	4.19± 0.22 b	347.43± 21.37 b	3.37± 0.10 b	278.45± 15.92 a	1.25± 0.05 a
Rbt	7353.18± 532.79 b	23.72± 1.72 b	4.25± 0.17 a	300.86± 21.25 a	3.43± 0.08 a	247.30± 16.45 b	1.22± 0.06 b
Parity	**	**	**	**	**	**	**
1	7194.26± 476.95 e	23.21± 1.54 e	4.36± 0.19 a	312.89± 26.87 e	3.46± 0.08 a	248.89± 16.90 e	1.26± 0.05 a
2	7941.88± 506.14 d	25.62± 1.63 d	4.25± 0.20 b	336.63± 26.42 c	3.44± 0.09 b	268.82± 17.15 c	1.25± 0.04 a
3	8459.96± 293.61 b	27.29± 0.95 b	4.20± 0.20 c	347.81± 24.07 a	3.35± 0.08 d	281.84± 13.00 b	1.23± 0.04 b
4	8681.14± 694.53 a	28.00± 2.24 a	4.21± 0.25 d	342.80± 29.97 b	3.37± 0.12c	286.55± 21.50 a	1.24± 0.05 c
≥5	8227.99± 755.52 c	25.90± 2.44 c	4.23± 0.19 c	341.60± 33.82 d	3.37± 0.08 c	276.39± 24.06 d	1.25± 0.06 b
Interaction	**	**	**	**	**	**	**
Sbt X 1st	7415.90± 241.22	23.91± 0.78	4.37± 0.19	324.70± 16.81	3.46± 0.08	256.59± 8.95	1.26± 0.08
X 2nd	8129.77± 221.85	26.22± 0.72	4.24± 0.20	344.71± 17.05	3.38± 0.09	274.79± 8.74	1.25± 0.06
X 3rd	8505.70± 215.30	28.72± 0.45	4.10± 0.20	348.75± 17.45	3.31± 0.07	281.51± 8.42	1.23± 0.09
X 4th	8785.52± 270.80	30.59± 0.87	3.94± 0.19	346.13± 14.60	3.27± 0.08	287.27± 10.31	1.20± 0.08
X ≥ 5th	8490.43± 256.30	27.23± .18	4.14± 0.20	351.48± 16.90	3.35± 0.09	284.41± 7.33	1.24± 0.07
Rbt X 1st	6499.48± 171.25	20.64± 0.55	4.29± 0.17	278.85± 13.50	3.45± 0.08	224.21± 7.22	1.25± 0.04
X 2nd	7125.62± 115.76	21.97± 0.37	4.27± 0.16	304.87± 14.77	3.44± 0.07	245.1± 8.15	1.24± 0.05
X 3rd	7589.92± 210.54	23.93± 0.68	4.23± 0.16	322.24± 16.11	3.42± 0.07	259.57± 7.89	1.24± 0.05
X 4th	7750.02± 208.49	26.29± 0.45	4.23± 0.15	327.82± 17.37	3.41± 0.08	264.27± 10.39	1.23± 0.06
X ≥ 5th	7467.66± 189.16	24.52± 0.72	4.24± 0.17	316.62± 16.25	3.43± 0.09	256.15± 7.10	1.23± 0.05
Farm	**	**	**	**	**	**	**

*Sig. at level 5% (p≤ 0.05) ; ** Highly Sig. at level 1% (p≤ 0.01). a, b, c and d the values to the different letters are significantly different.

Table (2): Pearson Correlation coefficient between milk yield and its fat and protein components of black (Sbt) Holstein type.

Sbt type of Holstein					
Item	**Fat%**	**Protein %**	**Fat(kg)**	**Protein (Kg)**	**F/P Ratio**
Milk yield	-0.49**	-0.55**	0.64**	0.89**	-0.25**
Fat %	--	0.56**	0.31**	-0.17**	0.81**
Protein %		--	0.11**	0.13**	0.02 NS
Fat (kg).			--	0.71**	0.46**
Protein (Kg)				--	0.28**

** significant on 0.01 * significant on 0.05 NS: non-significant.

The results in Table (3) demonstrated a strong positive correlation between milk yield and the amounts of fat (0.64 and 0.69) and protein (the same value 0.89) in Sbt and Rbt, respectively. Additionally, there is a positive association between the percentage of fat and the percentage of protein as well as the fat/protein ratio; in Sbt and Rbt, types these values were (0.56 and 0.28) and (0.81 and 0.31), respectively. Furthermore, there were strong correlations between the value of fat content and both the amount of protein and the F/P ratio, these values were (0.71 and 0.76) and (0.46 and 0.42) in Sbt and Rbt, respectively.

Table (3): Correlation coefficient between milk yield and its fat and protein components of red Holstein type (Rbt).

Milk traits	Fat%	Protein %	Fat in kg.	Protein in Kg	F/P Ratio
Milk yield	-0.03	-0.14**	0.69**	0.89**	-0.22**
Fat %		0.18**	0.08*	0.01 NS	0.13**
Protein %			-0.06*	-0.06*	0.01 NS
Fat in kg.				0.76**	0.42**
Protein in Kg					-0.25**

** significant on 0.01 * significant on 0.05 NS: non-significant

Hence, the selection process for milk production could result in a direct selection of fat or protein amounts. Also, selecting the amount of fat can result in a strong association response to protein content.

Also, there is a positive correlation between the percentage of fat and both % protein and fat /protein ratio these values were (0.56 and 0.81) and (0.28 and 0.31), in Sbt and Rbt, respectively. There is also a positive correlation between the amount of protein and the F/P ratio with values of 0.28 and 0.25 in Sbt and Rbt, respectively.

There is a negative correlation between milk yield and both fat and protein percentages in Sbt and Rbt, with values of (-0.49 and -0.30) and (-0.55 and -0.14), as well as, between milk yield and F/P ratio (-0.25 and -0.22), respectively. In addition, the protein values of (-0.17 and -0.12) in two types of Holstein German cattle, Sbt and Rbt, showed a negative correlation with F percentage.

Data in Table (4) show that, except the milk protein yield in Kg., the H^2 values of all studied milk characters of Sbt are higher than those of Rbt type. Fat percentage exhibited the highest H2 values (0.39 ±0.04 and 0.37±0.05 of SBT and Rbt, respectively), than those of almost all studied milk characters, whereas the H2 values of fat yield character of Sbt (0.17±0.04) and Rbt (0.16±0.03) are the lowest. It should be noted that H^2 values of milk protein percentage are relatively high (0.32±0.03 for Sbt and 0.31±0.04 for Rbt).). Also Table (5) show the heritability (H^2) . values of milk yield and its components of five consecutive parities of both SBT and RBT types. It is clearly shown that parity no.3 exhibited the highest H^2 values of milk yield and its components when compared with those of the other studied parities (1, 2, 4 and **≥5**). As rule, H^2 values of milk fat % are the highest than those of MY, DMY, Fat yield in Kg., protein %, protein yield in Kg. and F/P ratio in all five consecutive parities, while H^2 values of fat yield in Kg. are the lowest than those of the other milk characters in all five consecutive parities. The H^2 values of protein % are also high through the five consecutive parities

Table (4): Heritability values (H^2) of milk yield and its components of two Holstein breeds (SBT and RBT)

Milk characters	(H^2)	
	SBT	RBT
MY	0.26±0.06	0.24 ±0.04
DMY	0.24 ±0.04	0.23±0.05
Fat%	0.39 ±0.04	0.37±0.05
Fat (kg)	0.17±0.04	0.16±0.03
Protein%	0.32±0.03	0.31±0.04
Protein (kg)	0.19±0.05	0.20±0.04
F/P Ratio	0.21±0.05	0.19±0.06

Table (5): The heritability (H^2) values of milk yield and its components of two Holstein types and five consecutive parities.

Holstein types and parities	MY	DMY	Fat%	Fat (kg)	Protein%	Protein (kg)	F/P Ratio
SBT	0.26±0.06	0.24 ±0.04	0.39 ±0.04	0.17±0.04	0.32±0.03	0.19±0.05	0.21±0.05
RBT	0.24 ±0.04	0.23±0.05	0.37±0.05	0.16±0.03	0.31±0.04	0.20±0.04	0.19±0.06
Cow parity 1	0.27±0.04	0.25±0.06	0.38±0.04	0.19±0.03	0.32±0.05	0.19±0.06	0.20±0.04
Cow parity 2	0.29±0.04	0.26±0.05	0.37±0.05	0.17±0.03	0.33±0.04	0.20±0.05	0.21±0.05
Cow parity 3	0.31±0.03	0.28±0.05	0.39±0.04	0.18±0.04	0.34±0.04	0.22±0.05	0.24±0.06
Cow parity 4	0.32±0.05	0.30±0.06	0.38±0.04	0.20±0.04	0.35±0.05	0.23±0.06	0.27±0.06
Cow parity ≥5	0.33±0.04	0.29±0.05	0.37±0.05	0.23±0.03	0.33±0.04	0.25±0.06	0.25±0.05

In current evaluation the h^2 values of milk yield and its components partially agree with those reported in German cattle by **Bömkes *et al.*, (2004); Schneider *et al.*, (2023)**; and **Chen *et al.***, (**2023**) who estimated the genetic parameters for milk performance traits of German cattle and found that heritabilities were h^2 = 0.30, 0.24 and 0.20 for milk, fat and protein yield, respectively. In Chilean cattle **Uribea and Lembeyeb (2020)** also found relatively similar results. In India, **Verma** *et al.*, (**2017**) found that heritability of DMY, DFY and FY were 0.185, 0.178 and 0.195, respectively. Phenotypic correlations of the first lactation 305 days and/or less milk yield with DFY and FY were positive and statistically were also highly significant (p <0.01). So, moderate estimates of heritability and high genetic correlation between milk yield and its component traits may increase the scope of improvement of Holstein types (Sbt and Rbt).

Data reported herein are also partially in accordance with those of Pelmu**ş** ***et al.*, (2021)** in Romanian cattle, in which they estimated the heritability values for milk yield that ranged between 0.377 and 0.417. They also found that the heritability of fat test-day yield was low (ranged between 0.117 and 0.236) and for protein test-day yield was medium (ranged from 0.308 to 0.372). The correlations between test-day milk yields ranged from 0.28 to 1. Genetic correlations between test day fat and protein yields were high. The estimate of heritability for first-lactation milk yield of Holstein Friesian herds in Ethiopia was 0.30 and ranged from 0.17 to 0.29 for the different stages of lactation **(Tadesse, 2023)**. Some contradiction was found in Taiwan dairy cattle by **Pangmao** *et al.*, **(2022),** in which they estimated the heritability of DMY, peak milk yield and protein percent and found that they have moderate to high estimates ranged from 0.19 to 0.45, while days to peak milk yield was persistent. The fat percent had low heritability ranging from 0.08 to 0.14 in 1st lactation. Further, heritability of most traits considered was higher in 1th lactation when compared to 2nd and 3rd lactations. For cows in 1st lactation a high genetic correlation was found between 305-day milk yield and peak milk yield (0.86±0.07), while it was persistent with days to peak milk yield (0.99±0.02). Estimates of genetic correlations between the remaining traits were imprecise due to the high standard errors. The genetic correlations within the traits across lactation were high. Otherwise, **Tirfie, (2023)** found that the heritability of milk composition trait ranged from 0.24 to 0.49 for Fat%: 0.28 to 0.53 for P%: 0.41 to 0.59 and for total solid content 0.17 to 0.68 for the solid not fat content of cow milk, respectively. **Swalve (1995)** estimated the genetic parameters for milk yield, fat, and protein. Heritability estimates were 0.32, 0.19, and 0.20 for yields of milk, fat, and protein, respectively. The estimated genetic parameters did not seriously depart from the most available in spite of they are mathematically more precise for estimating the true parameters.

Genetic improvement of traits depends on how much genetic variation exists in a herd. Because they have a direct relationship, the greater the genetic difference, the greater the chance of a larger variant. Trait heritability assessment is one of the effective methods to find out the trend of genetic variation in a population under environmental conditions. (**Goshu *et al.*, 2014**). Heritability is defined as the expected variation in the genotype of the animal for each unit of difference in animal phenotype for any trait. It indicates the quantity of variations in animal performance for a particular trait is measured by genetic factors as compared to environmental factors. Low heritability estimates for production traits indicated that the main variations were due to non-genetic effects as compared to genetic variations. Heritability involves the genetic evaluation calculations, prediction of selection response, and helping producers decide which is the most efficient way to improve a trait, whether through management or through selection. (**Miglior *et al*., 2017**).

Unquestionably, enhancing management methods and environmental aspects would be a more successful strategy when combined with enhancing dairy animals' genetic potential. To maximize the improvement of a breeding target involved in the features related to the income and the human health, dairy cattle breeding programs integrate milk production, reproduction, and health traits. Enhancing population genetic progress and breeding impacts is beneficial when genetic parameters are appropriately calculated (**Mark, 2004; vanRaden, 2004 and Montaldo *et al*., 2010**).

Heritability is an essential measurement for the selection of polygenic traits such as milk yield and its composition. Information about heritability is very important for the evaluation of the animals breeding value and it impacts considerably the chosen breeding methods. The low heritability is not only given by a low genetic variation but also by a higher phenotypic variation due to size of herd and by random or unidentified environmental factors (**Javed *et al.*, 2001**). Heritability evaluation could be increased by providing a regular environment, use of multiple measurements, modification of some records, and accurate measurement of the respected data (**Haile, 2010).** Different estimates of heritability may be found for the same traits in different herds or in the same population at different times.

Sullmn *et al*. (1988) reported that genetic evaluations were used to compare Canadian red and black Holsteins for various production traits. Significant differences (P<0.05) between two types of Holstein, with black and white being more favorable were seen for MY and fat yields, as well as for evaluations of fat and milk protein yields of bulls progeny. However, there was a large genetic overlap between the herds for almost all studied traits. Pleiotropic impacts the color gene although it was not detected as an important. MY, fat yield, and fat percent may have pleiotropic trends. Phenotypic trends for milk yield, milk fat yield and milk fat percent were significant greater for Sbt than Rbt (P<0.01).

Hence, the red and white population has been receiving genetic material from the black and white via the heterozygoty and this infusion of genes for milk yield and fat content has likely helped to maintain the genetic progress of these traits in both red and white Holstein. However, different selection goals may play a role in maintaining a distinction between the two types. Genetic differences, if any, between red and black Holstein may have resulted from selection, founder effect (chance) and pleiotropy (a single gene influencing two or more distinct phenotypic traits) due to linkage or within herd preferential treatment.

CONCLUSION

It can be concluded that the Sbt type differs in milk yield and its composition traits when compared to Rbt, however an improving milk production in dairy cattle has to consider both genetic and environmental factors**.**

ACKNOWLEDGMENTS

The researchers deeply acknowledge the United Information Systems for Animal Breeding, Kassel, Germany, for providing the required data used in this study.

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الملخص العربى

الأداء المظهرى والمكافئ الوراثى لصفات إنتاج اللبن ومكوناته فى سلالتينن من ماشية اللبن الألمانية

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تهدف هذه الدراسة الى تقييم الأداء المظهرى والمكافئ الوراثى لصفات إنتاج اللبن اليومى والسنوى ومكوناته من البروتينات والدهون فى خمسة مواسم حلب متتالية لسلالتين من ماشية اللبن الألمانية (SBT الهولوشتاين الأسود و RBT الهولشتاين الأحمر). ولقد أظهر التحليل الإحصائي لهذه الصفات أن هناك احتلافات معنوية بين أداء هاتين السلالتين الألمانيتين وكذلك بين مواسم الحليب (بعد الولادات) المتتابعة لصفات أنتاج اللبن اليومى والسنوى ومكونات اللبن مقدرة كنسبة الدهن ونسبة البروتين وككمية البروتين والنسبة بين الدهن والبروتين، وأظهرت النتائج أيضا أن أداء صفات انتاج اللبن ومكوناته المذكورة أعلى فى السلالة SBT من السلالة RBT وأن أداء هذه الصفات أعلى فى موسم الحليب الرابع عن باقى المواسم، وأظهرت نتائج تحليل معامل الإرتباط أن هناك ارتباطا سالبا بين صفة محصول اللبن بالكيلو فى مواسم الحليب ونسبة البروتين والدهون بينما كان هناك ارتباط موجب بين صفة محصول اللبن اليومى والموسمى فى كلتا السلالتين. وأظهرت النتائج أن المكافئ الوراثى لجميع هذه الصفات (ما عدا صفة كمية البروتين بالكيلوجرام فى المحصول الكلى للبن) كان عاليا فى السلالة SBT عنه فى السلالة RBT، أن المكافئ الوراثى لنسبة الدهن فى اللبن كان الأعلى فى السلالتين بينما كان المكافئ الوراثى لكمية الدهن بالكيلوجرام هى الأقل. كذلك كان المكافئ الوراثى لنسبة الدهن فى الخمسة مواسم حليب تحت الدراسة هو الأعلى، وكان المكافئ الوراثى لصفة كمية الدهن هو الأقل، وأظهرت النتائج أن المكافئ الوراثى لصفة نسبة البروتين فى اللبن كان عاليا خلال مواسم الحليب.