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RESEARCH TITLE

correlation of phenotypic, behavioral and biochemical variation with milk production and its components in cows

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Abstract

Some behavioral parameters of cows were correlation to their milk production, as it was observed that there was a negative correlation between the behavior of cows during milking and milk production ($r = -0.224$), ($p \leq 0.05$) and it was revealed that cows tended to kick more and ruminate less during milking, thus producing a smaller amount of milk, and body length has an effect on daily milk production, as it is The correlation is very weak ($r=0.15$), and affects daily milk production by 2.31%, The value of the correlation coefficients (r) for the height of the front udder, the height of the back udder, and the depth of the udder 0.16 (very weak), 0.25 (weak), and 0.44 (moderate), respectively. These variables affected daily milk production by 2.63%, 6.16 % and 19.53%, respectively. The phenotypic correlations between milk production and udder characteristics ranged from -0.11 for rear udder height to 0.10 for front teat position, while the correlation was negative -0.31 between udder depth and milk production and -0.23 between udder depth and fat production . It was noted that the highest level of hemoglobin in the blood of cows was in the first months of production (2-3 months), and it was found that the highest total protein content in the blood serum of cows was at the peak of production, as it reached 82.2 g/l after that, and its content decreased in the recent period of production, as reached 79.39 g/l.

Key Words: Phenotypic, biochemical, and temperament correlations of cow

عنوان البحث

ارتباط التباين المظهري والسلوكي والكيموحيوي بانتاج الحليب ومكوناته في الابقار

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المستخلص

تم ربط بعض العوامل السلوكية للأبقار بإنتاجها للحليب، إذ لوحظ وجود علاقة ارتباط سلبية بين سلوك الأبقار أثناء الحلب وإنتاج الحليب ($r = -0.224$) ، ($p \leq 0.05$) وتبين أن الأبقار يميل إلى الركل أكثر والاجترار بشكل أقل أثناء الحلب، وبالتالي إنتاج كمية أقل من الحليب، كما أن طول الجسم له تأثير على إنتاج الحليب اليومي، إذ أن الارتباط ضعيف جداً (r=0.15)، ويؤثر على إنتاج الحليب اليومي بنسبة 2.31. %، قيمة معاملات الارتباط (r) لارتفاع الضرع الأمامي وارتفاع الضرع الخلفي وعمق الضرع 0.16 (ضعيف جداً)، 0.25 (ضعيف)، 0.44 (متوسط) على التوالي. . وقد أثرت هذه المتغيرات على إنتاج الحليب اليومي بنسبة 2.63%، 6.16%، 19.53% على التوالي. تراوحت الارتباطات المظهرية بين إنتاج الحليب وخصائص الضرع من −0.11 لارتفاع الضرع الخلفي إلى 0.10 لوضع الحلمة الأمامية، في حين كانت العلاقة سالبة −0.31 بين عمق الضرع وإنتاج الحليب و −0.23 بين عمق الضرع وإنتاج الدهن. . ولوحظ أن أعلى مستوى للهيموجلوبين في دم الأبقار كان في الأشهر الأولى من الإنتاج (2−3 أشهر)، كما وجد أن أعلى محتوى بروتيني كلي في مصل الدم للأبقار كان في ذروة الإنتاج حيث وصلت بعد ذلك إلى 82.2 جرام/لتر، وانخفض محتواها في الفترة الأخيرة من الإنتاج حيث وصل إلى 79.39 جرام/لتر.

الكلمات المفتاحية: الارتباطات المظهرية ، الكيموحيوية ، مزاج الابقار.

Introduction

Improving breeds with the aim of increasing production is impossible without studying the physiological and biochemical processes and behavioral traits in the organism, as the high reactivity of animals during milking is one of the undesirable temperamental responses as it leads to an increased risk of accidents, and thus leads to a decrease in animal care, which It makes milking operations more difficult and slower (Sutherland and Huddart, 2012). Among the current studies that focus on the temperament of dairy cows, most of them investigated the relationship between temperament during milking and milk productivity in European breeds (Abdel-Hamid et al., 2017), as some of these studies indicated that more reactive animals tend to produce lower quality milk (Hedlund and Lovlie , 2015). However, there is no strong consensus on this negative association between production and mood, as it was found in some of these studies that more reactive cows had greater milk production (Sawa et al., 2017). Modern trends in the milk industry require constant work to improve the genotypes and phenotypes of cattle, Recently, there has been more interest in body and udder measurements to develop the body of cattle, as neglecting them can lead to reduced production and poor health status of the animal and thus to the elimination of Cows are early, and visual assessment and recognition of the characteristics of a cow's udder are primary indicators of milk production, longevity and reproductive potential of the animal. Janković, (2017) Selection of cows on the basis of milk production can lead to a reduction in the values of other traits related to the species and longevity, and these traits are of great economic importance. Therefore, in order to increase the productivity of the animal, it is necessary to direct the selection also to the characteristics of the species that are apparently and genetically linked to milk production (Stanojević et al., 2018). (Janković, 2017) studied the relationship between milk production characteristics and udder characteristics, with the presence of positive correlations with the exception of udder depth and teat length. It is known that blood has an important role in maintaining vital body functions, the main function of which is the metabolism process In the body, therefore, blood indicators are used not only to monitor the health of animals, but also to study their productive qualities (Mazur, 2020). Recently, several researches have been conducted on auxiliary biological tests that can speed up and improve the accuracy of animal husbandry practices and animal evaluation methods, as research revealedreported on the relationship between morphological and biochemical factors of the blood and the productive traits of animals (Zaplatinsky and Fedorovych ,2017). Montanholi et al., (2017) found that animals with a higher metabolism have a higher milk productivity . Studies have shown that body weight is related to milk production in cows The difference in body weight (BW) is followed by changes in measuring body shape and milk production (Soeharsono, 2020). It is known that milk manufacturing takes place in the milk production unit called the lactic vesicles in the mammary gland, as the ability to manufacture milk depends on Milk depends on the number and efficiency of mammary epithelial cells, which is affected by protein intake and is hypothetically affected by the measurement of body shape and udder (Rezaei et al., 2016) . Studying the udder of dairy cows is important as an indicator of the productive potential of cows, as inter-comparisons indicated that there is a large variation in the measurements of the udder and its teats in different breeds (Abisoye et al. 2021), which may be deformed, causing huge economic losses and having a significant impact on the welfare and productivity of dairy cows (Khmelnychyi et al., 2022). Since studies have found that the presence of deformities in the udder and teats, cows will be more susceptible to infection with pathogens that cause mastitis (Singh et al., 2014), and due to the proven positive correlations between udder measurements and shapes with milk production traits (Oshin et al., 2021), there is a possibility of indirect selection Cows, which will be effective for improving these traits. It should also be noted that the measurements and characteristics of the udder and teats are largely hereditary traits (Khmelnychyi et al., 2022), Therefore, it could be another selection advantage for high-producing dairy cows (Constantin and Mihaela ,2021). Temperament is expressed through a set of behavioral and physiological responses as a strategy to adapt to stressful situations in the environment (Koolhaas et al., 2010), However, most studies recognize that characterizing temperament is complex because it can take into account different traits, such as coping style, emotionality, and sociability, (Koolhaas and Van Reenen ,2016) and studies have shown the importance of studying temperament. Cattle in breeding, as some studies reported that dairy cows that were calmer and more obedient in the milking

parlor (milking temperament) produced a greater amount of milk (Neave et al., 2022), In addition, there is a lack of studies evaluating the relationship between cow temperament and milk quality (Gergovska et al., 2014), and milkability parameters (Shehar et al., 2015). Some of these studies have indicated that calmer animals produce milk with greater fat and protein content (Antanaitis et al., 2021) while other studies have shown contradictory results, showing that more reactive cows produce higher percentages of fat in milk (Cziszter et al., 2016) The problem faced by breeders and small business owners is that there is a limited possibility of knowing the body weight and production records of cows Breeders choose dairy cows based on visual estimation of body and udder sizes only without any quantitative measurements It is certain that this method is far from accurate in obtaining productive dairy cows High levels of milk For this reason, there is a need for a simple and inexpensive measurement method that can be used by everyone as a guideline for estimating cow productivity (Soeharsono et al., 2020). This study aims to determine the phenotypic and behavioral variation and morphological and biochemical parameters of cows' blood and their relationship to milk production, in addition to studying the relationships Between temperamental characteristics and the concentration of cortisol and oxytocin in milk and their relationship to milk production.

1- The Correlation of behavioral standards to milk production

Some behavioral standards and the mood of cows during milking were linked to milk production, as Marçal-Pedroza et al (2020) noted a negative correlation between cows' behavior during milking and milk production ($r = -0.224$), ($p \leq 0.05$) and revealed the tendency of cows to kick More and less rumination during milking and thus producing a smaller amount of milk, On the other hand, it was noted that there is no relationship between the behavior of cows in the barn and milk production ($p \leq 0.05$), as many studies have clarified the relationship between the temperament of cows and milk production, especially in European breeds, as The results were mixed Dodzi and Muchenje (2011) found a negative relationship between kicks and milk production, while Cerqueira et al., (2017) reported that both strides and kicks were negatively related to production in Holstein cows, and Hedlund and Løvlie (2015) that the relationship between cow interaction and production was dependent on the number of calves, because in older animals the greater number of steps was related to a decrease in milk production, and conversely, in younger cows, which were very active, an increase in milk production was observed. Hedlund and Løvlie (2015) stated that there is a correlation between high interaction and an increase in milk production, as they stated that cows that are more mobile during milking may also be more aggressive while consuming feed, and thus eat more feed and produce more milk . Studies have reported a negative relationship between the time cows spend ruminating and the blood cortisol concentration in cattle, and this indicates lower levels of anxiety and stress during rumination, which is reflected with a lower cortisol concentration (Bristow and Holmes 2007), Thus, we can conclude that there is a positive relationship between rumination and production because cows with higher milk production eat more feed to compensate for energy demand and also increase rumination time (Clement et al., 2014), and according to Kaufman et al., (2018) at the beginning of production, the daily milk production of cows was positively associated with rumination time.

2- Correlation of cows' temperament with the concentration of cortisol and oxytocin in milk

Marçal-Pedroza et al., (2023) noted that the concentration of cortisol and oxytocinin in milk is related to the mood of the cows during milking, as the cows were classified into categories according to temperament into high, medium, and low (Table 1), where it was noted that the cows with the greatest interaction during udder preparation before milking contain a percentage 95.05% more cortisol in their milk than in calmer cows, When the milk parts were installed on the cows' udder teats, it was noted that the concentration of cortisol in them was 100.09% greater than in cows classified in the RStca-Low classification, As for the cows that had more steps during milking (STEPS-High), the percentage of cortisol in their milk was 81.43% higher than the cows with a calm temperament (STEPS-Low), and animals that kicked while milking tended to have 28.40% more cortisol in their milk than cows that did not kick. The high concentration of cortisol in milk for cows with a more reactive temperament during milking, these cows showed behavioral and physiological signs of stress during milking, which indicates that reactive cows are more susceptible to stress during routine

interactions, as cows that kicked more or took more steps in the parlor Milkers produced milk with higher cortisol concentrations than their calmer counterparts.(Gygax et al,2006), oxytocin concentrations were also higher in cows that showed greater degrees of reactivity during milking, as measured by higher degrees of reactivity during teat cup attachment, as Sutherland and Tops (2014) noted that cows with higher levels of Higher RStca arousal in a new milking environment (emotional stress) tends to have higher blood oxytocin concentrations, suggesting that oxytocin may be related to the behavioral stress response. Oxytocin is the hormone responsible for milk supply and maintenance of lactation but has also been indicated As a physiological reaction to stressors (Hedlund and Løvlie,2015). In the study (Marçal-Pedroza et al., 2023), the milk of reactive cows contained higher concentrations of cortisol and oxytocin, which indicates that the high concentration of oxytocin may be part of the stress response in these cows, which are likely high in dealing with stress, and may This occurs as an attempt to mitigate the effects of stress during the milking process, as oxytocin has anti-stress effects. It is an anxiolytic, however, and a study Chen and Sato (2017) indicates that a high concentration of oxytocin in female rodents leads to a decrease in the concentration of cortisol The same thing happens in dairy cows that are accustomed to a new milking environment, where the There is an increase in the release of oxytocin as the cows get used to the new environment, accompanied by a decrease in the concentration of cortisol It was found that in the new milking environment (psychological stress), the concentration of cortisol in the blood was greater before milking, and the concentration of oxytocin was greater after milking. These results indicate that Pre-milking cortisol level moderated the oxytocin response to the novel environment (Hedlund and Løvlie 2015).

3-The correlation between cows' temperament and the content and quality of milk

The most reactive cows during preparation for milking showed a decrease in the percentage of protein in the milk compared to the least reactive cows, as it recorded a rate of 3.17%, The results did not record any significant differences in the percentage of fat and lactose between the most and least reactive cows (Table 3) When the milking parts were installed on teats The udder The moderately reactive cows recorded an increase in the percentage of fat in the milk, as it recorded a percentage of 1.25% compared to the most and least reactive cows The results did not record any significant differences in the percentage of protein and lactose As for the cows that had more steps, the results recorded a significant increase in the protein percentage in the most and least reactive cows. interaction compared to moderately reactive cows, which recorded 3.30% and 3.31%, respectively, while the results did not record any significant differences in the percentage of fat, protein, and lactose in the cows with the most and the least number of kicks (Marçal-Pedroza et al., 2023). Calmer cows, as measured by the degree of reaction during milking preparation, produced milk with a higher protein content, while cows that were calmer while teat cups were tied tended to produce lower fat content (Morales-Piñeyrúa et al., 2022) , and the temperament of the cows also affects the quality Milk: Cows that entered the milking parlor slowly tended to produce milk with a higher percentage of lactose compared to faster cows (Kruszyński et al., 2013). In contrast, Cziszter et al., (2016) reported that milk produced by cows that are more agitated in the milking parlor contains greater proportions of fat than milk from cows with an average temperament, which contain a lower percentage of protein than Calmer, more agitated cows While McCarthy et al., (2017) found that more agitated and calmer cows produced milk with a higher fat content than cows with an average temperament.

Table 1: The correlation between cows' reaction scores and the percentage of cholesterol and oxytocin in cows' milk

Dependent variables	Temperament classes			P-value
	Low	Intermediate	High	
	Rsprep			
Cortisol ng/ml	0.56^{b}±6.23	0.54^{b} ±7.35	1.12^{a}± 12.15	**
Oxytocin pg/ml	0.49^{b}±5.29	0.47^{b} ±5.75	0.99^{a} ±7.82	*
	Rstca			
Cortisol ng/ml	0.60^{b} ±5.44	0.54^{b} ±6.89	0.71^{a} ±10.88	**
Oxytocin pg/ml	0.55^{ab}±5.82	0.49^{b}± 4.91	0.65^{a}±7.21	*

	Steps			
Cortisol ng/ml	0.53^{b}± 6.03	0.63^{b}± 7.23	0.88^{a}±10.93	**
Oxytocin pg/ml	0.50 ±5.50	0.56± 6.56	0.79± 5.01	NS
	Kicks			
Cortisol ng/ml	0.44^{b} ±7.06	-	1.05^{a} ±9.06	*
Oxytocin pg/ml	0.36±5.76	-	0.87 ±5.87	NS

[a,b]with different superscripts in the same column are significantly different. NS: Not significant *: P≤0.05; **: P≤0.01; Rsprep, degrees of reaction during pre-milking preparation, Rstca, degrees of reaction when installing the milking parts on the udder teats, Step, number of steps, Kicks, number of kicks (Marçal-Pedroza et al ., 2023) .

Table 2: The correlation between cows' reaction scores and some milk components

Dependent variables	Temperament classes			P-value
	Low	Intermediate	High	
	Rsprep			
Fat%	0.05±1.12	0.05 ±1.15	0.06± 1.26	NS
Protein%	0.05^{a}±3.33	0.05^{a} ±3.33	0.06^{b} ±3.17	*
Lactose%	0.06±4.49	0.06±4.47	0.07±4.44	NS
	Rstca			
Fat%	0.05^{b} ±1.12	0.05^{a} ±1.25	0.05^{ab} ±1.19	*
Protein%	0.05±3.27	0.05± 3.30	0.05±3.27	NS
Lactose%	0.06±4.48	0.06±4.43	0.06±4.49	NS
	Steps			
Fat%	0.05± 1.13	0.05± 1.24	0.05±1.18	NS
Protein%	0.05^{a} ±3.31	0.05^{b}± 3.19	0.05^{a}± 3.30	*
Lactose%	0.05±4.47	0.06±4.47	0.06±4.50	NS
	Kicks			
Fat%	0.04 ±1.18	-	0.06 ±1.14	NS
Protein%	0.05±3.26	-	0.06 ±3.35	NS
Lactose%	0.05±1.16	-	0.02±1.50	NS

[a,b]with different superscripts in the same column are significantly different. NS: Not significant *: P≤0.05; **: P≤0.01; Rsprep, degrees of reaction during pre-milking preparation, Rstca, degrees of reaction when installing the milking parts on the udder teats, Step, number of steps, Kicks, number of kicks (Marçal-Pedroza et al ., 2023)

4- The correlation of body dimensions and weight to milk production

There is a possibility to predict daily milk production based on body dimensions and weight, as morphological measurement is one of the breed variables that affects milk production (Durón-Benítez et al.,2016), as Soeharsono et al (2020) indicated that phenotypic signs are a genetic expression in response to the environment , including nutrition, and that there are four variables, body length, rear udder height, front udder height, and udder circumference affect daily milk production significantly, so they can be used as estimators of daily milk production, as it has been noted that when cows reach the age of 18 months, they will not The body length then increases (Sampurna et al.,2014). The length of the body measures the vertebrae indirectly with the tissues between the vertebrae arranged in a longitudinal line At the same time, the chest circumference measures not only the circumference of the bones that make up the chest cavity but also the tissues associated with it, especially muscle and skin, In estimating body weight, The highest correlation is also determined by chest circumference Likewise, morphometric measurements to determine the appropriate amount of space in a cow barn are also determined by chest area parameters (Cerqueira et al.,2013). It has been observed that there is no linear relationship between body weight and chest circumference of dairy cows, on the one hand, and daily milk production, as studies indicate that low body weight is associated with a low fat-to-protein ratio, However, it does not affect milk production, but fluctuations in milk production

during the lactation period are related to changes in chest circumference (Duplessis et al.,2014). It has been observed that body length affects daily milk production linearly, as the correlation coefficient is very weak (r = 0.15), and affects daily milk production by 2.31%, and the remaining 97.69% is affected by other factors, Body length in ruminants is related to the length of the small intestine, A large part of the process of digestion and absorption of nutrients occurs, and these nutrients are processed to turn them into a milk substitute in the mammary gland, This fact explains that milk production will increase or decrease linearly, according to the longest body length, followed by the length of the small intestine, which is the most absorbent of nutrients , which may increase daily milk production (Petrovska et al.,2014).

5- The correlation of udder measurements to milk production

The anatomically larger udder of dairy cows means the presence of a large number of milk sacs as the primary producer of milk, and therefore needs more endocrine support, as Soeharsono et al (2020) found that the value of the correlation coefficients (r) for front udder height and udder height Back and udder depth were 0.16 (very poor), 0.25 (poor), and 0.44 (moderate), respectively, These variables affected daily milk production by 2.63%, 6.16%, and 19.53%, respectively, While the remaining proportions were affected by other variables, these results were similar to those of a study of zebu cattle in the northern region of Cameroon, where there were significant correlations between udder diameters and heights and milk yield (Mingoas et al.,2017). According to Pantelić et al., (2012) the phenotypic correlations between milk production and udder traits ranged from -0.11 (posterior udder height) to 0.1 (front teat position), while the phenotypic correlations between gender traits and milk production ranged from -0.31 (udder depth and milk production) and - 0.23 (udder depth and fat yield) and -0.29 (udder depth and protein yield).

6- The correlation of blood biochemical characteristics to milk production

The biochemical characteristics of blood in cows depend on the production period and type of animal production (Table 3), It was noted Mazur et al.,(2020) that the highest level of hemoglobin in the blood of cows was in the first months of production (2-3 months), and that the highest number of red blood cells was at the beginning of the production period. While these parameters decreased and reached their lowest level in 8-9 months, however, it should be noted that the level of hemoglobin and the number of red blood cells change during the production period and this may be due to increased oxidation processes in the blood of cows with increased milk production and a decrease in hemoglobin level. The number of red blood cells gradually decreases as productivity decreases, as well as the number of white blood cells increases, as it increased by 0.5 from 2-3 to 8-9 months of the production period. And stated Selection of animals according to the content of blood serum protein is an effective and efficient method, and indicates the possibility of using it in selecting cows, as the concentration of total protein in the blood serum is affected by several factors, one of which is the production period, as it was found that the highest total protein content in the blood serum of cows was at 2 -3 months of the production period, which is the peak of milk production, as g/l reached 82.2, After that, its content decreased and its lowest level was determined during 8-9 months of the production period, as it reached g/l 79.39, which is clearly due to the cows' pregnancy. In recent months, the body uses a large amount of protein as a material for the growth and development of the fetus, causing the total protein content in milk cows to decrease from 2-3 to 8-9 months of production by 3.6 ($P \leq 0.01$), and the total blood protein in cows is formed It consists of two parts - albumin and globulin, as the normal level of these parts in the blood is very important because albumin is used for the synthesis of certain tissue proteins (Pishchan, 2017), However, during production, some changes were observed, as it was noted that the albumin content in the blood was higher during 2-3 months of the production period, and became lower in the subsequent period (up to 8-9 months), as it became lower by 3.1%. Analysis of the content of globulin fractions in Blood in cows showed that the number of α and β globulins was the highest at the beginning of production, and the content of these fractions decreased from 2-3 to 8-9 months of production by 0.9 and 1.4, respectively. (Mazur et al. 2020). An increase in the A/G ratio was noted during the period of 2-3 months of production compared to the last period of 8-9 months of production. While the results did not show a relationship between the percentage of globulin, total calcium content, and CA:P with the period of milk

production, appropriate attention should be given to the process of mineral metabolism in animal bodies. Microelements actively participate in the body's energy metabolism and influence the conversion of feed nutrients into animal products Calcium and phosphorus belong to vital minerals for cows, as the main storage site for calcium in the body is bone tissue. In the first stage of the production period, cows consume up to 40% of calcium from bone tissue And later (Mazur et al.,2020).

Table 3: correlation of blood content to milk production period

Parameters	Lactation period months			
	2-3	5-6	8-9	mean
	Dairy type			
Total protein g/l	0.84±82.9	0.66±80.7	0.52**±79.3	0.46±81.0
Albumins%	0.80±46.4	0.70±44.7	0.55**±43.3	0.44±44.8
Globulins%	0.80±53.6	0.70±55.3	0.55**±56.7	0.44±55.2
Globulins%- α	0.60±13.1	0.37±12.6	0.46±12.2	0.27±12.6
Globulins%- β	0.48±11.4	0.57±10.7	0.58±10.0	0.32±10.7
y- Globulins%	1.29±29.1	±32.01.04	0.80**±35.5	0.71±31.9
A/G	0.02±0.87	0.02± 0.81	0.018**±0.77	0.015±0.82
Total calcium mg	0.28±10.2	0.47 ±10.6	0.22±10.4	0.19±10.4
Ca:p	1±1.9	1±1.88	1±2.05	1±1.94

[a,b]with different superscripts in the same column are significantly different. NS: Not significant *: P≤0.05; **: P≤0.01 (Mazur et al., 2020)

Mazur et al (2020) found that the blood mineral content of cows varied slightly during production, (Table 4). In particular, the blood calcium content of cows at 5-6 months of production was slightly higher , Obviously, these changes are explained by the fact that at the beginning of production, when the highest milk yield of cows is observed, the greatest amount of calcium is excreted with milk, which leads to a significant deficiency in the blood, At the end of production, the low percentage of calcium in the blood is attributed to the body transferring this element for the growth and development of the fetus. It should be noted that the highest levels of calcium and phosphorus were observed in dairy cows, as they were characterized by a positive correlation between daily milk production and hemoglobin content (r = 0.57). Glucose (r = 0.49), alkaline phosphatase activity (r = 0.43) and a negative correlation between the content of y-Globulins (r = -0.625) ,Noted by Djokovic et al., (2017) found that there is a relationship between morphological and biochemical parameters of blood and the period of milk production in Simmental cows, as they noted high levels of hemoglobin, red blood cell count, glucose, total protein, albumin, α and β globulin content, and the ratio of albumin to globulin, in addition to high activity Aspartate aminotransferase and alkaline phosphatase in 2-3 months, Tkach, (2013) revealed that high-producing cows have the lowest level of hemoglobin and red blood cell content at the beginning of production, and as productivity decreases after that, blood parameters rise, In the case of medium and low productivity, The properties of blood oxidation (hemoglobin and red blood cells) change in parallel with the milk production of cows, in other words, with a decrease in milk production, the content of hemoglobin in the blood and the number of red blood cells also decrease, according to Novak and Fedorovych (2009), in dairy breed cows, During

production, the number of red blood cells and glutathione concentration decreased while hemoglobin decreased and the protein level increased slightly, while aspartate aminotransferase activity in blood serum increased during production, alanine aminotransferase activity decreased slightly and the globulin concentration in the protein fractions decreased during the production period. There was no significant difference in the content of α, β, and Y-globulins during the production periods studied.

Table 4: Correlations between biochemical parameters and milk production in dairy cows

Correlation pairs	Milk cows
Hemoglobin	**± 0.32 0.57
Erythrocytes	0.12±0.016
Leukocytes	- 0.05±0.003
Glucose	**0.49±0.24
Alat	- 0.24±0.05
AST	**0.46±0.21
Alkaline phosphatase	*0.43±0.19
Total protein	**0.53±0.28
Albumins	**0.51±0.26
- globulins α	0.22±0.05
Globulins - β	**0.47±0.22
Y- globulins	** - 0.62±0.39
Calcium	- 0.03±0.001
phosphorus	0.29±0.08

(^{a,b}with different superscripts in the same column are significantly different. NS: Not significant *: P≤0.05; **: P≤0.01 (Mazur et al .,2020)

Conclusion

The results of the current study indicate that there are phenotypic, behavioral, and biochemical correlations with milk production in cows, as the values obtained for the correlations were reflected in the production and characteristics of milk, and that dealing with the temperament of cows is linked to milk production, as calm and average cows in the barn produce more milk in addition to that. The cows with the best temperament in the milking parlor (calm and average cows) produced milk with a lower fat content and a higher protein content, and the most reactive cows during milking produced milk with higher concentrations of cortisol and oxytocin. It is possible to predict milk production in cows based on body measurements and udder characteristics, as heavier cows produce more milk. In addition, studying the udder of dairy cows is important as an indicator of the productive potential of cows, and the safety of the udder from deformities is important in maintaining production and preventing mastitis.

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