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THE EFFECT OF PRODUCTION´S STAGE ON THE PROPORTIONS AND COMPONENTS OF MILK AND BLOOD BIOCHEMICAL COMPONENTS OF COWS RAISED IN IRAQ

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Abstract:

There is a direct relationship between the amount of fat in milk and the amount of milk production, as the amount of fat in milk decreases at the beginning and end of the production stages and decreases during the middle of the production stage. Therefore, this research was conducted at the Taj Al-Nahrain cattle station in Al-Qadisiyah Governorate, where the cows were divided into three groups in which they were collected. 720 samples of cow's milk for a period of 90 days from Holstein Friesian cows. The daily milk production, milk production in (30, 60, and 90) days, and the total milk production and corrected milk production for (305) days were calculated. 360 blood samples were obtained from all cows, 180 A sample of 60 Holstein-Friesian cows to calculate biochemical characteristics. The results showed that there is a statistical relationship between the daily milk production, corrected for energy, protein, fat, fat percentage, and the stage of milk production. It is possible to predict the daily and corrected production (for energy, protein, fat, and fat percentage) at different production stages with high accuracy from... Through mathematical equations.

Keywords: milk production - milk components - biochemical blood characteristics

INTRODUCTION:

Cow breeding is considered one of the most important elements of animal production and is an important part of the economic wealth of many countries in the world. The interest in raising and improving the productivity of these animals is one of the basic aspects that researchers have paid attention to. Therefore, it has become necessary to rely on the scientific strategy to obtain more productive and adapted animals. This is what made Researchers' interest is in finding alternative methods to traditional methods of improving production, which requires great effort and time (Shibru et al., 2019; Raed et al., 2023) and given the existence of daily milk production records in private milk production stations, so there has become an interest By evaluating milk parameters as indicators of other parameters of the stages of lactation, the researchers therefore focused on milk composition using the fat to protein ratio as an indicator of the amount of fat in cows after birth (Toni et al., 2011; Karrar et al., 2023).

MATERIALS AND METHODS :

In this study, 60 Holstein-Friesian cows belonging to the Taj Al-Nahrain cattle station in Al-Qadisiyah Governorate were used. Samples were taken for the period from 2/1/2120 to 5/1/2120, and all basic data for each animal were recorded, such as cow number, age, lactation season, date of birth, and production. The daily milk supply, the number of milking times, and the number of births per cow. The cows were raised in semi-shaded pens designated for their shelter, which included birth pens, replacement wheels, and cows. The herd management was taken care of according to a specialized program that included nutrition, medical, veterinary, and health care. Milk samples were collected from 60 cows (Holstein Friesian) at a rate of (60) ml for each cow, and the percentages of the main milk components (fat, protein, lactose, and non-fat solids) were estimated for each cow at a rate of once a week throughout the experiment period, which amounted to 90 days. The samples were collected from the morning milking and the device used for this purpose was a device. Laboratory milk analysis EKO MilK is of Dutch origin and is located in the Chemistry Laboratory in the Department of Animal Production - College of Agriculture - Al-Muthanna University. After collecting samples during the milking process, blood samples were collected once a month, via the jugular vein, with a volume of (10) ml, and were separated by a centrifuge (FANEM) of Brazilian origin and was kept in the refrigerator at a temperature of (5)°C. Then it was separated in a centrifuge for 15 minutes at a speed of (3000) rpm, after which the upper part of the serum was separated from each tube and transferred to special serum tubes with nozzles. It was sealed and kept in the freezer at a temperature of (-20°C). The estimation process was carried out using the (SPECTRO

PHOTO METER) device in the Physiology Laboratory / Department of Animal Production / College of Agriculture / University of Basra. The level of triglycerides and blood serum cholesterol was measured, and the corrected milk was calculated. For energy, corrected for fat, and corrected for protein according to the method explained by Hall (2022). Analysis of variance and RLSD test between means were also conducted for the studied traits using a completely randomized design and using the ready-made statistical program SPSS (2019), according to the following mathematical model equation:

yijk=μ +p.j+eijk

whereas:

yijk = observed value (k) at breed (i) and milk production stage (j).

μ = overall mean.

p.j = effect of milk production stage j (j = 3, beginning, middle and end of production stage).

eijk = the effect of observational experimental error (k) with mean zero and variance · 2e.

RESULTS AND DISCUSSION:

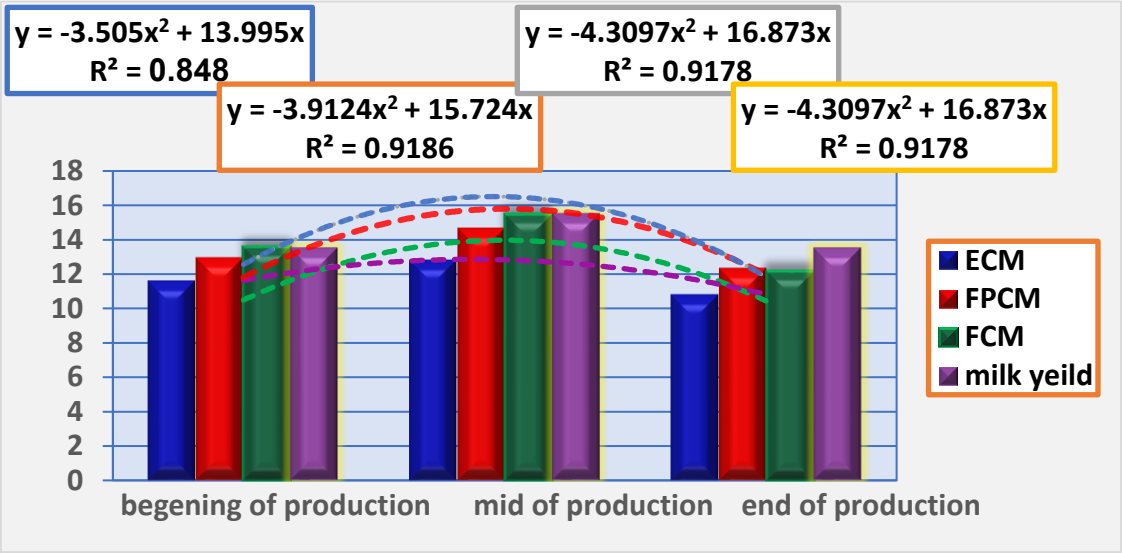
Production of milk corrected for energy, fat and protein

When correcting the daily energy production in milk, there were significant differences (P<0.01) in the amount of daily milk production in the same direction that occurred for milk corrected for fat percentage and corrected for fat and protein together (Table 1), with production at the middle of the production stage (12.83 kg) superior to the amount Daily milk energy-corrected at the beginning of the production stage (11.63 kg) and at the end of the stage (10.82 kg). The quantity of daily milk production corrected for fat and protein at the middle of the production stage (14.66 kg) was significantly (P<0.05) greater than its quantity at the beginning and end of the milk production stage (12.59 and 12.34 kg, respectively). In the same direction, the production of fat-corrected milk in the middle of production (15.49 kg) exceeded its quantity at the beginning and end of the production stage (13.58 and 12.17 kg, respectively). When calculating the energy in milk, milk energy exceeded mid-production by 22.01 megajoules/kg, compared to 19.65 and 19.71 megajoules/kg at the beginning and end of the production stage, respectively. This result was consistent with what he found (Abdul Sada, 2018) in a study on beaten cows in Iraq. Both the daily milk production corrected for fat and the daily milk production corrected for energy were significantly affected (P<0.05) by the stage of milk production, as the amount of daily milk production corrected for fat percentage exceeded In the middle of the production stage, at the beginning and end of production. While energy level was not affected by the stage of milk production. The net energy of milk represents the energy provided by the milk produced, and it is equal to the heat produced by each component of the milk (fat, protein, and lactose). The value of the heat produced by the components was recorded as 9.29, 5.71, and 3.95 MCl/kg for each of the fat, protein, and lactose, respectively (Fiore et al. al, 2017).

Table No. (1) The effect of production stage on milk production corrected for energy, fat and protein in Holstein-Friesian cows ± standard error

Periods	ECM Kg	FPCM kg	Milk energy MgL/kg	FCM kg
begening of production	11.63[b] ± 2.134	12.95[b] ± 2.227	19.65[b] ± 0.57	13.58[b] ± 1.963
Mid production	12.83[a] ± 1.915	14.66[a] ± 2.094	22.01[a] ± 0.54	15.49[a] ± 1.785
End of production	10.82[b] ± 1.704	12.34[b] ± 1.749	19.71 [b] ± 0.53	12.17[c] ± 1.493
S.N	1P=0.0	1P=0.0	P<0.01	P<0.01

When calculating the relationship between daily milk production corrected for energy, protein and fat percentage, and fat percentage (Figure 1) with the stage of milk production, it appeared that there was a non-linear (quadratic) relationship depending on the type of trait studied. The corrected daily production of energy, protein, fat, and fat percentage showed a non-linear (quadratic) relationship, as the amount of production increased from the beginning of the milk production stage until the middle of the production stage, with an average of 13,995, 18,724, and 16,873 kg, respectively, then it began to decrease by 3,505 and 3,912 and 4,309 kg after the middle of the milk production stage until the end of the production stage.



(Figure 1) The nonlinear (quadratic) relationship between daily milk production, corrected for energy, fat, protein, fat percentage, and milk production stage.

The effect of the stage of milk production on the proportions and components of milk:

It can be observed that there are significant differences (P<0.05) in the percentage of lactose and protein, as the end stage of production (4.18% and 4.04%, respectively) exceeded the beginning and middle stage of production, and the amount of fat exceeded significantly (P<0.05) in the middle stage of production (0.631 kg).) at the beginning and end of the production stage. This proves the decrease in the amount of fat in milk at the beginning and end of the production stages compared to the middle of the production stage. The reason for this may be due to the existence of a direct relationship between the amount of fat in milk and the amount of milk production. The results were consistent with what they reported (Genaro et al. al., 2023, Ahmed, 2021, Bondan et al., 2018, Shibru et al. 2019 noticed a significant effect of the stage of milk production on the percentage of lactose sugar and the percentage of protein in it .

Table (2) shows the average percentages of milk components in Different stages of milk production in Holstein-Friesian cows ± standard error

Periods	milk cholesterol	Fat Kg	Protein Kg	fat%	protein%	Lactose%	Snf %
begening of production	23.37 ± 0.5	0.547[b] ± 0.088	0.379 ± 0.122	4.09 ± 0.03	3.61b ± 0.11	3.60b ± 0.11	5.5 ± 0.17
Mid production	24.25 ± 0.5	0.631[a] ± 0.078	0457 ± 0.141	3.80 ± 0.35	3.64b ± 0.10	3.98a ± 0.14	5.78 ± 0.15
End of production	23.37 ± 0.3	0.447[c] ± 0.071	0.416 ± 0.153	4.19 ± 0.02	4.04a ± 0.15	4.18a ± 0.17	5.71 ± 0.14
NS	**P<0.05**	**NS**	**NS**	**0.05**	**0.05**	**NS**	**N.S**

When calculating the relationship between the stage of milk production and milk components, the percentage of fat and the percentage of non-fat solids showed a quadratic relationship with an accuracy of 100 and 97%, respectively (Figure 2). The average decrease in the percentage of fat as the production stage progressed was 0.31% until reaching the middle of the milk production stage, then it began to increase slightly (0.34%) after the middle of the milk production stage until the end of the production season

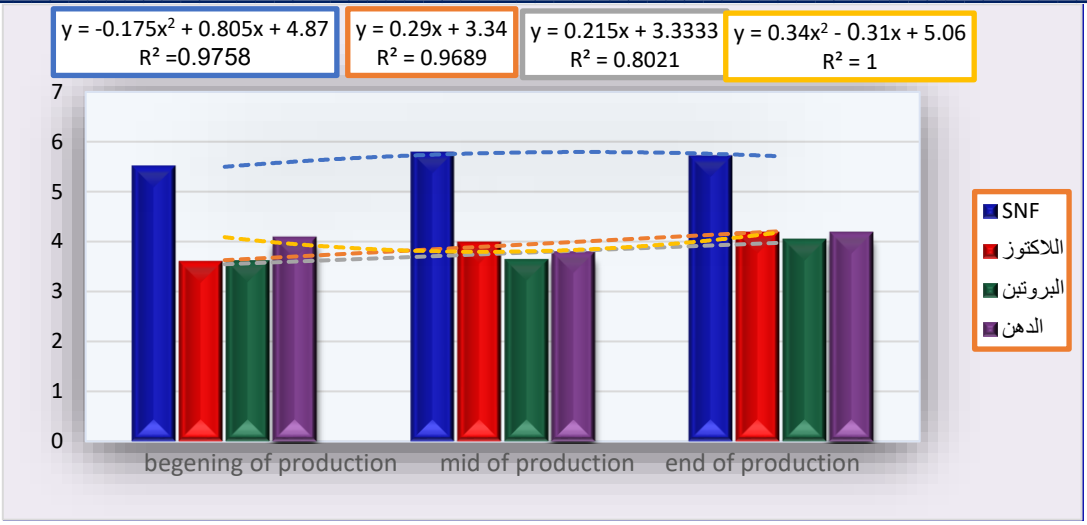


Figure 2) The linear and non-linear (quadratic) relationship between milk components and the stage of milk **)** production

The effect of milk production stages on blood serum triglycerides :

In Table (3), it was found that the average level of triglycerides in the blood serum of the cows used for the experiment was significantly higher (P<0.01) than its level at the beginning of production, as it reached (64.35) mg/dL, compared to its level at the middle of the stage, which amounted to (55.62) mg/dL. dL and the end of the production phase, which amounted to (46.94) mg/dL, and thus it was consistent with what they reported (Das et al., 2020) when they studied Holstein, Jersey, and club cows, and that the decrease that occurs in the level of triglycerides in the serum is due to an increase in The activity of the lipase enzyme in the udder to provide energy needs or to transfer some of it by the udder to produce milk, and the reason behind the decrease in the level of triglycerides may result from increased fat decomposition and decreased fat formation stimulated by insulin. (Piccione et al., 2012).

The effect of different stages of milk production on blood serum cholesterol:

Table No. (3) showed that there was a significant effect (P<0.01) of the different stages of milk production on the percentage of blood serum cholesterol, as the percentage of blood serum cholesterol decreased in the middle of the production stage, which amounted to (103.70) mg/dL compared to the beginning and end of the production stages, which was recorded (119.78 and 116.72 mg/dL, respectively. These results are in agreement with (Derkho et al., 2022). The decrease that occurs in cholesterol concentration during the stages of milk production is considered possible to be due to the endocrine glands benefiting from cholesterol for the purpose of producing androgens, which include the ovaries and placenta. For steroid production during pregnancy (Arfuso et al., 2016.(

The effect of different stages of milk production on the levels of high, low, and very low density lipoproteins in blood serum:

From Table No. (3), it can be seen that the stages of milk production did not significantly affect the levels of high-, low-density, and very low-density lipoproteins, as their levels remained stable during the different stages of production. This may be due to the fact that diet is an important and decisive factor in the variation in levels of lipoproteins. In the blood of cows, therefore, attention must be given to the feed provided to cows, as an increase in the hormone prolactin may lead to the inhibition of lipoprotein by increasing the activity and vitality of the ligase enzyme) in the fatty tissue, which causes an increase in triglycerides. Also, low-density lipoprotein (LDL) contains low protein and cholesterol. High (50% cholesterol and 10% triglycerides), which serves as the main carrier of essential fatty acids from the liver to peripheral tissues for cellular absorption and metabolism (Ahmed, 2021**.(**

Table (3) Effect of production stage on blood biochemical components mg/dL in the blood serum of Holstein-Friesian cows ± standard error

periods	VLDL	LDL	HDL	Cholesterol	Triglyceride
Begening of production	0.±19.296	2.14±60.06	2.07±63.43	2.07±119.78a	0.4±64.35a
	0.±20.035	2.08±62.17	2.08±57.89	1.36±103.70b	0.6±55.62b
Mid production	0.±19.574	2.42±55.44	2.73±57.31	1.35±116.72a	0.3±46.94c
N.S	NS	NS	NS	0.001	0.001

CONCLUSIONS:

Milk production begins to increase from the beginning of the production period until the middle of the production period, where it reaches its peak and then returns to decrease as the production stage progresses, while milk fat and protein decrease at the beginning of the production stages, then return and increase at the end of the milk production period. It is also evidenced that there is a high correlation between the components of milk and the proportions of Blood components can be predicted due to the difficulty of taking blood samples from cows and the ease of conducting analyzes on milk**.**

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