

Effect of Adding Choline Chloride in Some Physiological Traits during the summer

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Abstract

This study aimed to show the effect of adding choline chloride to the feed in some physiological traits during the summer in central Iraq. This study was conducted at Al-Khalis cows station in Diyala Governorate during the period from 2022/6/21 to 2022/ 9/21, where 25 Holstein cows between the ages of 3-5 years used, the cows were divided into five treatments, so that treatment T1 represents the control treatment (without adding Choline chloride), while treatments T2 and T3 add choline chloride untreated and treated with formaldehyde, respectively to the concentrated feed with an amount of 35 g /cow /day, T4 and T5 add choline chloride untreated and treated with formaldehyde respectively, with an amount of 70 g /cow /day, The addition of choline chloride treated with formaldehyde in treatment T3 resulted in a significant decrease ($P \leq 0.05$) at some times of the experiment in the number of breaths, as the respiratory rate in 5/8/2022 was 48.00 and 47.00 breaths/min in treatments T2 and T3 compared to 51.80 breaths/ min in T1 treatment in the second measurement treatment of the second measurement process, where the addition of choline chloride treated with formaldehyde in the T3 treatment caused a significant decrease ($P \leq 0.05$) in the respiratory rate, as it reached 51.60 breaths/min compared with treatment T1 to 49.50 breaths/min. we conclude from the current study that the addition of choline chloride to the concentrated feed with an amount of 35 g /cow /day It has a role in increasing the resistance to heat stress for cows by reducing the number of breathing cows at some times during the summer.

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Introduction

Heat stress is the rise in air temperatures and solar radiation, and it is one of the main factors affecting the productive and physiological performance of animals. Purebred dairy cows due to the selection to increase milk yield, which led to a significant improvement in production and a deterioration in the thermal endurance property. (Kadzere *et al*, 2002; Bohanova *et al*, 2007; Gaafar *et al*, 2011) In order to overcome this problem, researchers have conducted several studies to reduce the negative effects of heat stress on cows, including feed additives including choline chloride in the feed, It is a multifunctional component. In the blood, including it reduces the risk of developing fatty liver and

reduces the level of ketone bodies in the blood. It also acts to reduce the level of non-citric fatty acids and increase liver glycogen content (Davidson *et al*. 2008; Gutiérrez *et al*, 2019). The use of formaldehyde treatment of materials can give a positive result in reducing the decomposition of forage materials in the rumen by microorganisms and increasing the utilization of them in the body. Negative for the health of the animal or the consumer of animal products, according to what was stated in the report of the World Food and Agriculture Organization (Garg and Sherasia, 2011). Therefore, choline chloride was treated with formaldehyde to reduce its decomposition in the rumen and benefit more from it inside the body.

In the absence of a study in our country, Iraq, showing the effect of adding choline chloride to the feed on the performance of milk cows in the summer, this study was conducted to demonstrate the effect of adding choline chloride to the feed on the physiological performance of milk cows under conditions of heat stress in central Iraq.

Materials and Methods

The study was conducted at Al-Khalis cow's station in Diyala Governorate under conditions of heat stress in central Iraq, as 25 Holstein cows were randomly selected during the period from 6/21 to 2022 /9/21 in summer between the ages of 3-5 years. The cows were divided into five treatments, each treatment Five cows, treatment T1 represents the control treatment (without adding choline chloride) and treatments T2 and T3 in which untreated and formaldehyde-treated choline chloride were added to the concentrated feed at an amount of 35g/cow/day, respectively, and treatments T4 and T5 in which untreated choline chloride was added and treated with formaldehyde to concentrated feed with an amount of 70g/cow/day, respectively. The chemical composition of concentrated feed for cows contained 20.21% crude protein, 11.5% crude fiber, 6.20% fat and 47.0% carbohydrates in addition to hay, alfalfa and alfalfa as rough feed. Water was always available at all times. The body temperature of each cow was measured by means of a German-made electronic medical thermometer by placing it in the rectal opening so

that it is adjacent to the upper roof of the rectum for one minute twice a month at 1 pm. The number of respirations was measured by calculating the number of loin movements per minute and by visual observation for each cow twice a month at 1 pm. The heart rate of each cow per minute was measured by means of a stethoscope placed in the chest area, and through it the heart beats were heard and the number of beats per minute was calculated twice a month at 1 pm.

Randomized Complete Block Design (RCBD) was used using the ready-made program SPSS (2011) for the calculator in analyzing the results for the purpose of excluding the effect of the milk season and its overlap with the effect of the coefficients. The following mathematical model

Results and Discussion

The following table (1) shows effect of adding choline chloride to the feed on some physiological traits in Holstein cows in the summer. Includes the rectal temperature the number of breaths per minute and the pulse at the beginning of the experiment 2022/6/21. Shows that there are no significant differences between the treatments for the studied traits. The rectal temperature was 38.88, 38.92, 38.95, 39.12, and 39.24 °C, and the respiration was 42.80, 43.00, 43.00, 44.25, and 45.00 times/min. The pulse was 43.40, 42.25, 42.75, 44.50 and 44.40 beats/min, for treatments T1, T2, T3, T4, T5, respectively.

Table 1: Effect of adding choline chloride to the feed on some physiological characteristics of Holstein cows during the summer in 2022/6/21
(SE \pm mean)

Transactions	Rectal temperature (°C)	Respiration (times/min)	Pulse (beats/min)
T1 Control treatment without addition	38.88 \pm 0.17	42.80 \pm 0.73	43.40 \pm 0.98
T2 Add 35 g/cow/day choline chloride	38.92 \pm 0.13	43.00 \pm 1.73	42.25 \pm 1.10
T3 Add 35 g/cow/day of formaldehyde-treated choline chloride	38.95 \pm 0.17	43.00 \pm 1.73	42.75 \pm 1.10
T4 Add 70 g/cow/day choline chloride	39.12 \pm 0.17	44.25 \pm 2.17	44.50 \pm 2.32
T5 Add 70 g/cow/day of formaldehyde-treated choline chloride	39.24 \pm 0.26	45.00 \pm 1.64	44.40 \pm 1.47
Sig	0.660	0.641	0.673

*Level of significance in the analysis of variance table between treatments at $P \leq 0.05$ according to Duncan's multiple range test

In the second table, it is noted that there was a significant decrease $P \leq 0.05$ in breathing for the two treatments T2, T3 over the rest of the treatments, as they were 48 and 47 times per minute, respectively, while the rest of the treatments were 51.80, 50.50, 50.40 times per minute for the treatments T1, T4, and T5, respectively, and the reason may be due to The effect of choline chloride in reducing the effects of heat stress, as acetylcholine, which is derived from choline chloride, contributes to the expansion of blood vessels close to the surface of the skin during heat stress, which contributes to the elimination of excess body heat and leads to a decrease in the

number of breathing times, and thus reducing heat stress on cows in That period of summer, as Holdorf and White (2021) mentioned that eating Holstein cows protected choline in an amount of 60 g/cow/day led to a reduction in the effects of heat stress and thus a decrease in the respiratory rate, as it reached 71.8 and 65.6 breaths/minute in the two treatments of control and choline. Respectively, and while in the same table it is noted that there are no significant differences between the coefficients in the rectal and pulse temperature and cows in the experiment.

Table 2: Effect of adding choline chloride to the feed on some physiological characteristics of Holstein cows during the summer on 2022/8/5
(SE \pm mean)

Transactions	Rectal temperature (°C)	Respiration (times/min)	Pulse (beats/min)
T1 Control treatment without addition	39.20 \pm 0.26	51.80 \pm 0.49a	51.00 \pm 0.44
T2 Add 35 g/cow/day choline chloride	39.40 \pm 0.00	48.00 \pm 1.22b	49.25 \pm 0.25
T3 Add 35 g/cow/day of formaldehyde-treated choline chloride	39.42 \pm 0.16	47.00 \pm 1.52b	50.00 \pm 0.00
T4 Add 70 g/cow/day choline chloride	39.35 \pm 0.20	50.50 \pm 0.50a	50.75 \pm 0.75
T5 Add 70 g/cow/day of formaldehyde-treated choline chloride	39.32 \pm 0.23	50.40 \pm 0.74a	50.40 \pm 0.51
Sig	0.825	0.010	0.254

*Level of significance in the analysis of variance table between treatments at $P \leq 0.05$ according to Duncan's multiple range test

It is noted in table 3 you notice that there is also a significant decrease ($P \leq 0.05$) in the respiratory rate of cows in the T3 treatment, if it was 49.50 times per minute compared to the control treatment, which was 51.60 times per minute. The reason may be due to the role of choline chloride, which is an essential element in the metabolism process to build a structure Cells and maintaining them, as it works to inhibit oxidative stress caused by heat stress and programmed cell death, as high heat stress leads to an increase in the rate of

respiration, and the addition of choline chloride reduced that stress, especially when the amount was appropriate for cows and treatment with formaldehyde reduced the decomposition of choline chloride in the rumen, which It increased the rate of its absorption in the intestine (Yang *et al.* 2021). While in the same table, it is noted that there were no significant differences between the coefficients in rectal temperature, pulse coefficient.

Table 3: Effect of adding choline chloride to the feed on some physiological characteristics of Holstein cows during the summer on 2022/8/20 (SE \pm mean)

Transactions	Rectal temperature (°C)	Respiration (times/min)	Pulse (beats/min)
T1 Control treatment without addition	39.16 \pm 0.09	51.60 \pm 0.40a	52.00 \pm 0.00
T2 Add 35 g/cow/day choline chloride	39.52 \pm 0.15	51.25 \pm 0.47ab	51.00 \pm 0.57
T3 Add 35 g/cow/day of formaldehyde-treated choline chloride	39.47 \pm 0.21	49.50 \pm 0.50b	51.50 \pm 0.50
T4 Add 70 g/cow/day choline chloride	39.25 \pm 0.16	50.75 \pm 0.94ab	51.25 \pm 0.47
T5 Add 70 g/cow/day of formaldehyde-treated choline chloride	39.10 \pm 0.18	50.60 \pm 0.74ab	51.60 \pm 0.40
Sig	0.851	0.475	0.405

*Level of significance in the analysis of variance table between treatments at $P \leq 0.05$ according to Duncan's multiple range test

Table 4 shows in the third month of the experiment on 2022/9/5 that there were no significant differences between the treatments in those physiological characteristics, as the rectal temperature reached 38.30, 38.52, 38.42, 38.70, 38.62

°C, and respiration 47.00, 47.50, 48.00, 47.75, 47.40 times/min and pulses 48.40, 50.00, 50.00, 50.00, 50.00 pulses/min and for parameters T1, T2, T3, T4, T5 respectively.

Table 4: Effect of adding choline chloride to the feed on some physiological characteristics of Holstein cows during the summer on 2022/9/5 (SE \pm mean)

Transactions	Rectal temperature (°C)	Respiration (times/min)	Pulse (beats/min)
T1 Control treatment without addition	38.62 \pm 0.19	46.40 \pm 0.81	48.20 \pm 0.66
T2 Add 35 g/cow/day choline chloride	38.92 \pm 0.26	46.75 \pm 1.25	47.25 \pm 0.75
T3 Add 35 g/cow/day of formaldehyde-treated choline chloride	38.60 \pm 0.24	47.25 \pm 0.75	47.25 \pm 0.94
T4 Add 70 g/cow/day choline chloride	38.42 \pm 0.04	45.75 \pm 0.25	47.25 \pm 1.10
T5 Add 70 g/cow/day of formaldehyde-treated choline chloride	38.66 \pm 0.25	46.60 \pm 0.60	47.20 \pm 1.49
Sig	0.530	0.623	0.905

*Level of significance in the analysis of variance table between treatments at $P \leq 0.05$ according to Duncan's multiple range test

Conclusion

The T3 treatment, which includes adding choline chloride treated with formaldehyde in an amount of 35g/cow/day to the feed, is the best, as it led to reducing the effects of heat stress during the summer on cows in Iraq, which was reflected in improving daily milk production for some periods of time and reducing the number of breathing times per minute in some cases. Times during the experiment.

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