Plant Archives Vol. 19 No. 2, 2019 pp. 3467-3472 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF ADDING CHAMOMILE TO DIET AND WATER SPRAYING IN MILK PRODUCTION AND ITS COMPOSITION OF HOLSTEIN COW UNDER HEAT STRESS

Mohammed Ahmed Shwayel and Raghad Hazem Hamed Al-Mafraji

Department of Animal Production, College of Agriculture, University of Diyala, Iraq.

Abstract

This experiment was conducted in Iraq at alkhalis Dairy Cattle Station in the Diayla governorate during the months July, August and September for the period from 1/7 to 1/10/2017. The experiment aimed to reducing effect of heat stress in milk production and its composition of Holstein dairy cows by adding chamomile to Diet and Spraying with Water on the body during the afternoon (3 PM) and were divided into six treatment groups, T_1 control group (without adding Chamomile and without Spraying), T_2 and T_3 were added to diet 25 and 50 g / cow / day Chamomile, respectively and T_4 Treatment of Water Spraying only during the afternoon and T_5 and T_6 represents the treatment of Water Spray and the addition of Chamomile 25 and 50 g/cow/ day respectively. THI values indicate that dairy cows are exposed to the negative effects of heat stress (above 72) and that effects on the production performance of the cow. The results showed there was an increase but not significant of Chamomile treatment on daily milk production during September as it reached 12.51 kg/cow/day in the treatment of control compared 14.55 kg/cow/day in Treatment of add chamomile 50 g / cow / day as for the effect of the interaction between the Water Spraying and Chamomile the daily milk production was 11.16 kg/cow/day in T_1 and increased significantly ($P<0.05$) to 15.20 in T_6 treatment in period 1 of September. The Spraying of Water and the adding chamomile improved some of the total milk production but without significant and did not affect significantly on milk components (protein, fat, lactose, Ash and solids-not-fat).

Key words : Holstein, heat stress, Chamomile, Water Spraying.

Introduction

Dairy Cows suffer cows from high temperatures and solar radiation for long periods in several central and southern Iraq regions. The comfortable environmental temperature for dairy cattle ranges between 5 to 25^{0}C which is also known as the thermal comfort zone (McDowell, 1972) and When the environmental temperature is equal or above the body temperature, the cows countenance the risk of heat stress and milk production can be decreased by as much as 50% (Ben Salem and Bouraoui, 2009) It also lowers milk quality by reducing fat, protein and lactose in milk Causing significant economic losses in the livestock sector (Dunnn *et al.,* 2014) Which requires additional methods to reduce the temperatures Such as spraying with water during the afternoon Which is one of the main strategies that can be applied to reduce the adverse impact of temperature in summer on the performance of cows as it is one of the best ways to reduce the negative impact of heat stress in many countries (Tucker *et al.,* 2005: SDA, 2010) Considerable evidence suggests that water effectively reduces indicators of heat stress It also leads to increased feed intake and thus increased milk production (Bilby *et al.,* 2009) and in order to further reduce the negative impact of heat stress more, the use of other materials that can help Dairy cows to resist heat stress such as chamomile *(Matricaria chamomilla* L.*)* is one of the important medicinal herb It contains a large group of therapeutically interesting (Presibella *et al.,* 2006) It is used as infusion for sedative and anxiolytic purposes (Larzelere and Wiseman, 2002), as a digestive aid to treat gastrointestinal disturbances (Madisch *et al.,* 2001), and helping the healing of skin wounds and cuts (Mills and Bone, 2000). It also contains sedative and anti-heat compounds such as Salicylates, which is one of the components of Aspirin (Singh *et al.,* 2011) So it can be

***Author for correspondence :** E-mail : mohammedshwayel@gmail.com

used to reduce the effects of heat stress. So the experiment aimed to reducing Effect of heat stress on the production performance of Holstein dairy cows by adding chamomile to Diet and spraying with water during the afternoon.

Materials and Methods

This experiment was conducted at alkhalis Dairy Cattle Station in the Diayla governorate, Iraq. During the months of July, August and September for the period from 1/7 to 1/10/2017**.** The experiment aimed to reducing Effect of heat stress on the production performance of Holstein dairy cows by adding chamomile to Diet and spraying with water during the afternoon.

Use of 18 Holstein dairy cows were selected for this research. Dairy cows were selected based on the age 4 to 5 years. Since the experimental dairy cows were rearing with the other dairy cows in the dairy farm, the selected dairy cows were marked by using number for easy identification and taking care separately and were divided into six treatment groups, T_1 a control group (without adding chamomile and without spraying), T_2 and T_3 were added to diet 25 and 50 g/cow/day chamomile, respectively and T_4 Treatment of water spraying only during the afternoon and T_5 and T_6 represents the treatment of water spray and the addition of chamomile 25 and 50 g/cow/day respectively.

Chemical compositions for concentrates diet fed to animals during the experiment are reported in Table 1. Addition hay and alfalfa hay, who was present when the availability of green fodder scarves and water was always available to the animals.

Table 1: Chemical compositions of Concentrate diet and Chamomile.

Compositions	Concentrate diet *%	Chamomile%
Dry matter	98.14	99.18
Moisture	1.86	0.82
Crud Protein	15.29	12.50
Crud Fiber	6.16	4.33
Fat	6.20	6.14
Ash	4.33	4.20

* According to AOAC (1975).

Milking was performed two times in a day as in the morning at 6.00 am and afternoon at 4.00 pm. Milk yields (kg/d) of cows were recorded daily on record sheet.

Milk compositions were analyzed by using Lactoscan milk analyzer in the Ministry of Agriculture - Abu Ghraib Station in Baghdad.

Temperature and relative humidity were daily recorded by using a thermo hygrometer. Temperature-Humidity Index (THI) values were also determined during the experimental period using the following equation, as described by Mader *et al.,* (2006).

The data were subjected to statistical analysis using Factorial Experiments (3×2) according to Randomized Complete Blocks Design were used in the analysis of experiment data to Study the effect of the treatments studied and compared the differences between the test averages (Duncan, 1955) polynomial and use the program (SPSS, 1998) in the statistical analysis.

Results and Discussion

The average ambient temperature (ºC), relative humidity (%) and temperature humidity index (THI) are shown in Table 2. the third and fourth week of July and the first and second of the month in August recorded the highest value of the THI, where it reached 81.9, 82.3, 86.1 and 83.8 Respectively and THI values were in the last three weeks of September at least during the trial period. These high THI values indicate that most dairy herds are exposed to the negative effects of heat stress and that effects on the production performance of the cow.

Table 2: The average of Ambient temperature (ºC) and relative humidity (%) and Temperature-Humidity Index during the experiment period.

Months	Ambient temperature			Relative humidity			THI *
	3 am	6 pm	average	3 am	6 pm	Average	
July	46.4	28.7	37.5	25.7	10.1	17.9	78.7
	43.7	29.7	36.7	11.3	10	10.6	77.9
	49.7	32.4	41	10.4	10	10.2	81.9
	50.1	32.9	41.5	10	10.1	10	82.3
August	43.7	33.3	38.5	24	10	17	86.1
	43.5	33.4	38.4	17.2	10.4	13.8	83.8
	41.2	32.4	36.8	20.2	10.3	15.2	79.2
	40.3	29.7	35	17	10	13.5	77.1
September	40.4	31.4	35.9	21	10	15.5	78.3
	40.1	29.3	34.7	25.8	10.1	17.9	77.5
	39.2	28	33.6	25.4	10	17.7	76.5
	38.2	27	32.6	19	10	14.5	74.9

* Temperature-Humidity Index according to Mader et al., (2006) .

Table 3 showed Effect of adding Chamomile to Diet and Water Spraying on the milk production of Holstein Diary cow during July, August and September. It is noted from the table that there is no significant effect on milk production during the months of July and August. During the first period of September it was observed that there was significant effect ($P<0.05$) of chamomile on daily milk production as it reached 11.11 kg/cow/day in the treatment of add chamomile 25 g/cow/day compared with

Table 3: Effect of adding Chamomile to Diet and Water Spraying on the body in the milk production of Holstein Diary Cow (mean±SE).

Treatment	Milk production (kg/cow/day)					
	July		August		September	
	1st period	2nd period	1st period	2nd period	1st period	2nd period
Effect of water Spraying						
Without water spray	9.77±0.46	10.63±0.45	10.25±0.24	11.05±0.58	11.90±0.78	12.34±0.43
Water spray	11.55±0.83	10.63±1.00	10.36±0.83	11.90±0.82	13.55±0.71	13.42±0.57
Effect of Chamomile						
0 g/cow	10.83±1.01	10.86±0.88	10.03±0.75	11.66±0.99	12.51±1.19 ab	13.05±0.80
25 g/cow	10.00±0.85	9.26±0.69	9.81±0.51	10.13±0.22	11.11±0.37 b	12.11±0.51
50 g/cow	11.16±0.87	11.76±0.99	11.08±0.89	12.63±0.93	14.55±0.58 a	13.48±0.57
Water Spraying X Chamomile						
T_1	1.20±9.66	10.36±0.92	10.46±0.32	10.56±0.95	11.16±1.76 b	11.86±0.69
T_2	0.33±9.33	10.03 ±0.31	10.03±0.39	9.90±0.41	10.63±0.66 b	12.20±1.11
T_3	0.88±10.33	11.50±0.94	10.26±0.64	12.70±0.91	13.90±0.86 ab	12.96±0.52
T_4	1.52±12.00	11.36±1.67	9.60±1.60	12.76±1.68	13.86±1.48 ab	14.23±1.16
T_5	1.76±10.66	8.50±1.30	9.60±1.05	10.36±0.18	11.60±0.10 b	12.03±0.26
T_6	1.52±12.00	12.03±2.00	11.90±1.71	12.56±1.86	15.20±0.75 a	14.00±1.04

- The period is 14 days .
- T1 a control group (without adding chamomile and without spraying) , T2 and T3 were added to diet 25 and 50 g / cow / day chamomile, respectively and T4 Treatment of water spraying only during the afternoon and T5 and T6 represents the treatment of water spray and the addition of chamomile 25 and 50 g / cow / day respectively.
- Means with different small letters significantly different at $P<0.05$.

Table 4: Effect of adding Chamomile to Diet and Water Spraying on the body in the total milk production of Holstein Diary cow (mean±SE).

Treatment	Total milk production (kg)
Effect of water Spraying	
Without water spray	979.30±36.41
Water spray	1033.04±68.02
Effect of Chamomile	
g/cow	1012.78±75.53
g/cow	922.71±29.72
g/cow	1083.01±74.50
Water Spraying X Chamomile	
T_1	959.93±77.94
T_2	932.86±19.23
T_3	1045.10±77.72
T_4	1065.63±140.20
T_5	912.56±62.79
T_6	1120.93±142

- T_1 a control group (without adding chamomile and without spraying), T_2 and T_3 were added to diet 25 and 50 g / cow / day chamomile, respectively and T_4 Treatment of water spraying only during the afternoon and T_5 and T_6 represents the treatment of water spray and the addition of chamomile 25 and 50 g / cow / day respectively.

14.55 kg/cow/day in Treatment of add chamomile 50 g / cow / day. as for the effect of the interaction between the water spraying and chamomile the daily milk production was 11.16 kg/cow/day in T_1 (control treatment) and 10.63 for T_2 (add chamomile 25 g / cow / day) but increased significantly ($P<0.05$) to 15.20 in the T_6 (add chamomile 50 g / cow / day and water spray) and There was no significant effect of water spray on milk production during this month (September). Total milk production table 4 in the treatment without water spray was 979.30 kg compared 1033.04 kg in treatment of water spray and for the effect of Chamomile, the third treatment (50 g / cow / day chamomile) is more excelled (1083.01 kg) compared with treatment add 0 and 25 g / cow /day chamomile the milk production there was 1012.78 and 922.71 kg respectively. As for the effect of the interaction between the water spraying and Chamomile, the milk production in the T_1 was 959.93 kg and increased but not significant to 1045.10, 1065.63 and 1120.93 kg in the T_3, T_4 and T_6 respectively. as for as there was no significant effect among all treatment.

The Sample improvement in milk production is due to the cooling of blood in the blood vessels near the surface of the body, which will turn to the various organs and then return this blood to the surface of the body overloaded to get rid of them and thus feel comfortable and cold due to increased heat loss by evaporation (Chanchai *et al.,* 2010) It also leads to increased feed intake and thus increased milk production (Kendall *et al.,* 2007) and Chamomile contains a large group of therapeutically interesting and active compound classes.

Table 5: Effect of adding Chamomile to Diet and Water Spraying on the body in the milk composition of Holstein Diary cow during July (mean±SE).

Treatment	Protein %	Fat %	Lactose %	Ash %	Solids-not-fat %
Effect of Water Spraying					
Without water spray	2.96±0.06	3.48±0.15	4.43±0.10	0.66±0.01	8.07±0.19
Water spray	3.14±0.10	3.43±0.24	4.54±0.06	0.68±0.01	8.26±0.11
Effect of Chamomile					
0 g/cow	3.20±0.15	3.37±0.27	4.54±0.09	0.68±0.01	8.26±0.16
25 g/cow	2.95±0.10	3.77±0.28	4.42±0.16	0.66±0.02	8.04±0.29
50 g/cow	3.01±0.02	3.23±0.11	4.50±0.04	0.67±0.00	8.19±0.08
Water Spraying X Chamomile					
T_1	3.08±0.08	3.48±0.34	4.61±0.13	0.69±0.01	8.39±0.24
T_2	2.80±0.16	3.61±0.35	4.20±0.25	0.63±0.03	7.64±0.45
T_3	3.01±0.05	3.36±0.20	4.49±0.07	0.67±0.01	8.18±0.14
T_4	3.32±0.31	3.26±0.49	4.47±0.13	0.67±0.02	8.14±0.25
T_5	3.10±0.09	3.93±0.49	4.64±0.13	0.69±0.02	8.44±0.25
T_6	3.01±0.03	3.10±0.10	4.51±0.05	0.67±0.00	8.21±0.10

- T_1 a control group (without adding chamomile and without spraying), T_2 and T_3 were added to diet 25 and 50 g / cow / day chamomile, respectively and T_4 Treatment of water spraying only during the afternoon and T_5 and T_6 represents the treatment of water spray and the addition of chamomile 25 and 50 g / cow / day respectively.

Table 6: Effect of adding Chamomile to Diet and Water Spraying on the body in the milk composition of Holstein Diary cow during August (mean±SE).

Treatment	Protein %	Fat %	Lactose %	Ash %	Solids-not-fat %
Effect of Water Spraying					
Without water spray	3.15±0.12	3.35±0.19	4.72±0.18	0.70±0.02	8.60±0.34
Water spray	3.05±0.03	3.36±0.17	4.57±0.05	0.68±0.00	8.32±0.10
Effect of Chamomile					
0 g/cow	3.21±0.16	3.17±0.20	4.81±0.24	0.72±0.03	8.76±0.44
25 g/cow	2.97±0.08	3.67±0.24	4.44±0.12	0.66±0.01	8.09±0.22
50 g/cow	3.13±0.04	3.23±0.17	4.68±0.06	0.70±0.01	8.53±0.12
Water Spraying X Chamomile					
T_1	3.43±0.27	2.86±0.31	5.14±0.41	0.77±0.06	9.36±0.75
T_2	2.87±0.15	3.83±0.22	4.30±0.23	0.64±0.03	7.82±0.43
T_3	3.16±0.07	3.38±0.28	4.73±0.11	0.70±0.01	8.61±0.20
T_4	2.99±0.09	3.48±0.13	4.48±0.14	0.67±0.02	8.16±0.26
T_5	3.07±0.01	3.52±0.47	4.59±0.01	0.68±0.00	8.36±0.03
T_6	3.10±0.06	3.08±0.23	4.64±0.09	0.69±0.01	8.44±0.17

- T_1 a control group (without adding chamomile and without spraying), T_2 and T_3 were added to diet 25 and 50 g / cow / day chamomile, respectively and T_4 Treatment of water spraying only during the afternoon and T_5 and T_6 represents the treatment of water spray and the addition of chamomile 25 and 50 g / cow / day respectively.

Sesquiterpenes, flavonoids, coumarins, and polyacetylenes are considered the most important constituents (Singh *et al.,* 2011) Flavonoids such as quercetin, patuletin, luteolin and apigenin are also active in chamomile Lead to important biological roles as it works to increase the effectiveness of the immune system, which reduces the risk of some diseases and prolong the effectiveness of vitamin C and have the role of anti-inflammatory agents (Cook and Samman, 1996: Craig, 1999) These compounds act as highly effective antioxidants by protecting a number of important representative substances such as protein and red blood cells from various oxidative stress factors by free radicals and inhibition of cell membrane fat oxidation (Vaya *et al.,* 1997) It also contains sedative and anti-heat compounds such as Salicylates, which is one of the components of Aspirin Alpha-pisbolol, a component of chamomile, has a similar effect to salicylic acid (Tyler, 1993).

And It is noted from the tables 5, 6 and 7 that there is

Table 7: Effect of adding Chamomile to Diet and Water Spraying on the body in the milk composition of Holstein Diary cow during September (mean±SE).

Treatment	Protein %	Fat %	Lactose %	Ash %	Solids-not-fat %
Effect of Water Spraying					
Without water spray	3.17±0.07	4.27±0.12	4.87±0.13	0.73±0.01	8.87±0.23
Water spray	3.14±0.05	4.26±0.12	4.84±0.13	0.72±0.02	8.81±0.23
Effect of Chamomile					
0 g/cow	3.20±0.12	4.31±0.16	4.84±0.14	0.72±0.02	8.81±0.26
25 g/cow	3.20±0.09	4.15±0.15	4.74±0.13	0.71±0.01	8.63±0.24
50 g/cow	3.33±0.12	4.33±0.13	4.99±0.19	0.75±0.02	9.09±0.35
Water Spraying X Chamomile					
T_1	3.35±0.11	4.28±0.17	5.02±0.17	0.75±0.02	9.14±0.31
T_2	3.19±0.19	4.06±0.31	4.66±0.27	0.70±0.04	8.48±0.49
T_3	3.30±0.16	4.47±0.12	4.94±0.25	0.74±0.03	9.00±0.45
T_4	3.05±0.20	4.35±0.32	4.66±0.21	0.70±0.03	8.49±0.38
T_5	3.22±0.05	4.24±0.14	4.82±0.08	0.72±0.01	8.78±0.15
T_6	3.37±0.23	4.20±0.24	5.04±0.34	0.75±0.05	9.18±0.62

- T_1 a control group (without adding chamomile and without spraying), T_2 and T_3 were added to diet 25 and 50 g / cow / day chamomile, respectively and T_4 Treatment of water spraying only during the afternoon and T_5 and T_6 represents the treatment of water spray and the addition of chamomile 25 and 50 g / cow / day respectively.

no significant effect of Water Spray and addition of Chamomile and overlap between them on milk components, which include protein , fat, lactose, Ash and solids-not fat During the months of July, August and September.

Conclusions

From the above we conclude that Spraying with Water on the body and adding Chamomile (50 g/d./cow) on the diet reduced some from effects of heat stress on Holstein dairy cows Especially in September And did not affect the milk components**.**

References

A.O.A.C. (1975). Officials Methods of Analysis. Association of Official Analytical Chemists. 12th.ed. Washington D.C.USA.

Ben Salem, M. and R. Bouraoui (2009). Heat Stress in Tunisia: Effects on dairy cows and potential means of alleviating it. *S. Afr. J. Anim. Sci.*, **39:** 256-259.

Bilby, T.R., L. Baumgard, R.J. Collier, R.B. Zimbelman and M.L. Rhoads (2009). Heat stress effects on fertility: consequences and possible solutions. Proceedings Southwest Nutrition Conference. Department of Animal Sciences University of Arizona.

Chanchai, W., S. Chanpongsang and N. Chaiyabutr (2010). Effects of misty-fan cooling and supplemental rbST on rumen function and milk production of crossbred Holstein cattle during early, mid and late lactation in a tropical environment. *J. Anim. Sce.*, **81:** 230-239.

Cook, N.C. and S. Samman (1996). Flavonoid, chemistry, metabolism, Cardio – protective effect, and dietary sources. *J. Nutr. Biochem.*, **7:** 66-67.

Craig, W.J. (1999). Health-promoting properties of common herbs. *Am. J. Clin. Nutr.*, **70 :** 4990-4995.

Dunncan, D.B. (1955). Multiple range and multiple F test. *Biometrics*, **11:**1-42.

Dunnn, R.J.H., E. Dunnn Naomi, Mead, M. KateWillett and David E. Parker (2014). Analysis of heat stress in UK dairy cattle and impact on milk yields. *Environ. Res. Lett.*, **9:**1-11.

Kendall, P.E., G.A. Verkerk, J.R. Webster and C.B. Tucker (2007). Sprinklers and shade cool cows and reduce insect-avoidance behavior in pasture-based dairy systems. *J. Dairy Sci.*, **90:** 3671-3680.

Larzelere, M.M. and P. Wiseman (2002). Anxiety, depression, and insomnia. Primary Care, **29:** 339-360.

Mader, T.L., L.J. Johnson and J.B. Gaughan (2006). A comprehensive index for assessing environmental stress in animals. *Journal of Animal Science*, **88:** 2153-2165.

Madisch, A., H. Melderis, G. Mayr, I. Sassin and J. Hotz (2001). A plant extract and its modified preparation in functional dyspepsia. Results of a double-blind placebo controlled comparative study. *Zeitschrifit fur Gastroenterologie*, **39:** 511-517.

McDowell, R.E. (1972). Improvement of Livestock Production in Warm Climates. W.H. Freeman and Company, San Francisco.

Mills, S. and K. Bone (2000). Principles and practice of phytotherapy - modern herbal medicine. Edinburgh: Churchill Livingstone, 643.

Presibella, M.M., Larissa De Biaggi Villas-Bôas, Klézia Morais da Silva Belletti, Cid Aimbiré de Moraes Santos and Almeriane Maria Weffort-Santos (2006). Comparison of

Chemical Constituents of *Chamomilla recutita* (L.) Rauschert Essential Oil and its Anti- Chemotactic Activity. *Brazilian Archives of Biology and Technology*, **49(5):** 717-724.

Singh, O., Z. Khanam, N. Misra and M.K. Srivastava (2011). Chamomile (*Matricaria chamomilla* L.) : An overview. *Pharmacognosy Revie*., **5(9):** 82-95.

SPSS. (1998). Statical Package For Social Science. User's Guide For Statistics.

Tucker, C.B., G.A. Verkerk, B.H. Small, I.S. Tarbotton and J.R. Webster (2005). Animal welfare in large dairy herds: A survey of current practices. *Proc. N.Z. Soc. Anim. Prod*., **65:** 127-131.

Tyler, V.E. (1993). The Thomest Herbal. 3rd ed. Philadelphina : George F. Stickley Co. USA.

USDA. (2010). Facility Characteristics and Cow Comfort on U.S. Dairy Operations, 2007. 524.1010. USDA-APHIS-VS, CEAH. Fort Collins, CO.

Vaya, J., P.A. Belinky and M. Aviram (1997). Antioxidant constituents from licorice roots : Isolation, structure elucidation and antioxidation capacity toward LDL Oxidation. *Free. Radic. Bio. Med.*, **23:** 302-313.