IMPACT OF USING CHAMOMILE FLOWER AS A FEED ADDITIVE ON REPRODUCTIVE PERFORMANCE AND PHYSIOLOGICAL RESPONSES OF FARAFRA EWES DURING HEAT STRESS CONDITIONS

A. A. K. Saleh and G. F. Abozed

Sheep And Goats Dept., Animal Production Research Institute, Giza, Egypt.

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SUMMARY

This work was carried out to investigate the effects of Chamomile flower supplementation as a feed additive on reproductive performance and physiological responses of ewes during heat stress conditions. Forty-five healthy fertile Farafra ewes aged 2.0-4.0 years with an average body weight of 42.1 ± 0.92 kg were equally divided into three groups (15 ewes each), control group: received basal diet with no additives, T1: received basal diet + 0.5 gm chamomile flower /10 kg L.B.W/ day and T2: received basal diet + 1.0 gm chamomile flower /10 kg L.B.W/ day. The experiment lasted through a season of mating till parturition " during the summer season". Body weight of ewes was improved at the end of pregnancy and after lambing in both supplemented groups (T1 & T2) compared to the control group. Concerning reproductive performance, the number of ewes exhibited estrus in Chamomile supplemented groups (T1, T2) was higher than those in the control group. Also, supplemented ewes exhibited estrus earlier than control ones, especially in T2. Conception rate was improved by Chamomile supplementation, it was 93.3% in T2 followed by 80.0% in T1 and the lowest one was in the control group (73.3%). Also, the numbers of total and alive lambs born were higher in supplemented groups compared to control. In addition, Chamomile supplementation increased birth weight of lambs, this increase was significant ($P<0.05$) between T2 versus control (4.02 vs. 3.32 kg) however, it was not significant between T1 and control. Rectal and skin temperatures values were lower in both Chamomile supplemented groups compared to control. At the same time, respiration rate was decreased significantly in treated groups (32.5 in T1 and 32.8 in T2) than the control group (40.6). However, opposite trend of results was obtained in gas volume/minute and tidal volume. Metabolic rate (MR) and heat production (HP) were significantly ($P<0.05$) higher in T2 compared to both T1 and control groups. Serum total protein, albumin, and globulin tended to insignificantly increase with chamomile supplementation. In addition, serum urea, creatinine, AST and ALT concentrations did not significantly differ among groups and all values of these investigated blood metabolites were within the normal range of sheep. In conclusion, supplementation of chamomile flowers as a herbal feed additive had a beneficial effect on reproductive performance of ewes and the better improvement was observed with the high level of supplementation (1.0 gm chamomile flower /10 kg L.B.W/ day). Moreover, the investigated physiological responses during heat stress were improved by the supplementation with no adverse side effects on blood metabolites.

Keywords: *Chamomile, feed additive, reproductive performance, physiological responses, heat stress.*

INTRODUCTION

Small ruminants play a pivotal valuable role in socio-economic status of millions of small farmers, about 90% of small ruminant “sheep and goats” are owned by rural households (Ministry of Agriculture and Land Reclamation, 2015), which are characterized by poverty, poor feeding and housing facilities, lack of modern management skills, inappropriate breeding practices and inadequate adoption of technologies, which are essential to improve the productivity. In addition to the previous obstacles that face small ruminants production in our environment, heat stress appears as a major problem added to the previous ones. It was well proven that heat stress had strong bad effects on animal productive and reproductive performances, in terms of decreasing body weight gain and milk production, lowering fertility and conception rate and causing embryonic mortality, besides many adverse effects on physiological responses (Dash *et al.*, 2016).

Medicinal herbs and plants have been widely used for human since the old civilizations, especially ancient Egypt, and over the last five decades, there has been an increasing interest in the utilization of herbs and medicinal plants in animal nutrition as an effective and safe substitutions of chemical substances (antibiotics and hormones, etc…), some substances found in these plants and herbs had prophylactic and therapeutic effects (Linde *et al.,* 2001). Many investigations confirmed a beneficial impact of medicinal herbs and plants on nutrients digestibility, feed efficiency and productive performance of small and large ruminants (Maged 2004, Shehata *et al.* 2007 and Shwereb, 2012).

Chamomile (Matricaria chamomilla L.) belongs to a large group of medicinal plants, it contains a great number of therapeutically interesting active compounds such as sesquiterpens, flavonoids, coumarins, and polyacetylens, which have antiphlogistic and antiseptic effects (Singh, *et al.,* 2011). It has been reported that dietary Chamomile improved milk yield and composition (Shehata *et al.* 2004), improved ruminal environment and increased digestion coefficients (Maged 2004), reducing the incidence of digestive problems such as bloat and diarrhea and minimizing the mortality rate of the offspring (EL-Hosseiny *et al.*, 2000 & Shehata *et al.* 2007), besides the improvement that happened to some blood constituents such as (Cholesterol, ALT, AST and Alkaline Phosphatase) (Maged 2004, and 2011). Furthermore, it enhances immunity and prevent from aflatoxins effect (Tawfik *et al.* 2005). This beneficial effects of Chamomile might be referred to that it contained some active substances such as flavonoids, coumarins, aromatic oils (alpha bisabolol, azulene and chamazulene), which act as tonics, antiseptic, stomach pain release, anti-inflammatory and antispasmodic agents (Ody, 1993). In addition, Sepide and Alesaeidi, (2016) reported that Chamomile contained substances have an antioxidant and antibacterial activity. Antioxidants supplementation protect the body defense system against excessively produced free radicals during heat stress and stabilize the health status of the animal could ameliorate the bad effect of heat stress (Sivakumar *et al.*, 2010). Therefore, we attempted in this study to investigate the effects of Chamomile supplementation as a feed additive on reproductive performance and physiological responses of ewes during heat stress conditions.

MATERIALS AND METHODS

This study was conducted in Mallawi Animal Production Research Station (Mallawi city, Minia Governorate, which lies between longitudes 27 º 43 ' N, latitudes 30 º 50 ' E and 52 meters above sea level), Agriculture Research Center, Cairo, Egypt. Forty five healthy fertile Farafra ewes were included in this investigation, aged 2.0-4.0 years with an average body weight of 42.1 ± 0.92 kg. The study was carried out during summer season and lasted 6 months (from May to October 2016), along of mating and pregnancy seasons till parturition.

Ewes were divided homogenizely according to their age, parity and initial body weight into three equal groups (15 ewes per group). The three groups were fed as follow:

Control: Fed basal diet.

Treatment 1 (T1): Fed basal diet + 0.5 gm chamomile flower /10 kg L.B.W/ day.

Treatment 2 (T2): Fed basal diet + 1.0 gm chamomile flower /10 kg L.B.W/ day.

Animals were fed in groups according to NRC (1985). Ewes were weighted biweekly and feed amounts were adjusted according to their body weight changes. For the first month, ewes were fed on the experimented rations as acclimation period. Table (1) showed the chemical analyses of the used feedstuffs (concentrate feed mixture and rice straw).

Table (1): Approximate analysis of the used feedstuffs.

Item	DM	OM	CP	CF	EE	NFE	Ash
Concentrate feed mixture (CFM)	93.7	88.0	13.8	15.2	3.6	55.4	12
Rice straw	90.9	84.1	4.0	33.4	1.6	45.1	15.9

Measurements and procedures:

Reproductive performance:

A teaser ram was used for estrus detection of ewes three times daily for 35 days and fertile rams were used to breed ewes that presented estrus twice daily (at the beginning of estrus and after 12 hrs. later). Estrus duration (hrs.) and number of service per conception were recorded. Also, conception rate (%) was calculated by the number of parturated ewes divided by the total joined ewes. In addition, number of lambs born/ewe and birth weight recorded.

Thermal responses and respiratory activities:

Thermal responses in terms of rectal, skin and wool temperatures were taken and respiratory activities in terms of respiration rate and gas volume/minute was measured by Dry Gas Meters, tidal volume was calculated, O_2 consumption and CO_2 release were measured by oxygen analyzer (Servomex 570) then heat production (HP) and metabolic rate (MR) were calculated. All of these parameters were taken at 12.00 am. Ambient temperature and relative humidity were recorded.

Blood sampling and measurements:

Blood samples (5 ml) were taken from the jugular vein from each animal at morning before feeding and drinking. These samples were centrifuged at 3000 r.p.m. for 15 minutes. Separated serum was freezed until the analyses of blood metabolites. Some blood metabolites including Total protein, albumin, AST, ALT, urea, createnine were determined using commercial kits by colorimetric method.

Statistical analysis

Statistical analysis was carried out using SPSS v. 20.0 for Windows (SPSS Inc., Chicago, IL). Data were analyzed by One way ANOVA. Duncan's New Multiple Range Test ***(Duncan, 1955)*** was used to test the differences among means. The following statistical model was used:

$$\mathbf{Y_{ij}} = \mu + T_i + E_ij$$

Where, Y_{ij}= The studied trait, μ = The overall mean, T_i= The effect of treatment i = (T1, T2), E_{ij}= The experimental error.

RESULTS AND DISCUSSION

Body weight changes.

Results in Table (2) showed that average body weight of different groups of ewes at mating was almost the same, however, at the end of pregnancy, it was significantly higher in T2 compared to control (50.3 vs. 45.0 kg). After lambing, average body weight was significantly higher in both supplemented groups T1 & T2 (43.1 & 42.1 kg) compared to control (37.5 kg). It is well known that most of body weight increase during pregnancy refers to increasing fetal weight which also was improved by treatments (as we will see in

Table (2) Effect of Chamomile supplementation on body weight (kg) of ewes during different physiological status.

	Treatment		
Body weight (kg)	Control	T_1	T_2
At mating	42.1 ± 0.94	41.9 ± 0.92	42.0 ± 0.89
At the end of pregnancy	45.0^{b} ± 1.48	48.8^{ab} ± 1.41	50.3^{a} ± 1.67
After lambing	37.5^{b} ± 1.32	42.1^{a} ± 1.18	43.1^{a} ± 1.38

Control: Fed basal diet, T_1: Control + 0.5 gm chamomile flower /10 kg L.B.W/ day, T_2: Control + 1.0 gm chamomile flower /10 kg L.B.W/ day.
Values with different superscript letters in the same row are significantly different, ($P<0.05$)

birth weight). Similar results were found in sheep by Zeid *et al.*, (2011) and in goats by El-Hosseiny *et al.* (2000). This beneficial effect in body weight may be attributed to the improvement in digestibility and nutritive values due to Chamomile supplementation as a natural medicinal herb containing active ingredients, which act as an antiseptic against the antagonistic flora and stimulate the digestive enzymes and digestive processes. It has been reported that digestion coefficients of all nutrients and feeding values besides feed efficiency were improved with increasing the level of chamomile supplementation in sheep rations (Zeid *et al.*, 2011 & El-Kholany *et al.*, 2015 & 2017). Also, El-Ghousein, (2010) stated that chamomile supplementation improved the ruminal environment and increased digestion coefficients.

Reproductive performance.

Table (3) presents the results to study the effect of Chamomile supplementation on estrus exhibition and estrus period length. Generally, the number of ewes exhibited estrus in Chamomile supplemented groups (T1,T2) was higher than the control group. Also, supplemented ewes exhibited estrus earlier than control ones, especially in T2. This is beneficial because it will decrease number of services per conception for supplemented ewes. Similarly, Mirzaei *et al.*, (2011) reported that using medicinal herbs as a feed additive in sheep and goats nutrition enhanced estrus cyclicity. Also, Barhane and Singh (2002) reported that supplementation of Chamomile postpartum led to 100% estrus and 75% conception in the supplemented group as compared to 50 % in control cows. In addition, Zangeneh *et al.*, (2010) found that Chamomile can enhance estrus and help LH secretion "ovulation hormone" in rats.

Table (3): Effect of Chamomile supplementation on estrus exhibition and estrus period length.

Group	Ewes exhibited estrus / total		Estrus period length (hrs.)							
			12 to 24 hrs.		24 to 36 hrs.		36 to 48 hrs.		48 hrs. and more.	
	No.	(%)	No.	%	No.	%	No.	%	No.	%
Control	13	86.7	3	20.0	6	40.0	3	20.0	1	6.7
T_1	14	93.3	3	20.0	9	60.0	2	13.3	0	0
T_2	14	93.3	4	26.7	10	66.7	0	0	0	0

Control: Fed basal diet, T_1: Control + 0.5 gm chamomile flower /10 kg L.B.W/ day, T_2: Control + 1.0 gm chamomile flower /10 kg L.B.W/ day.

Regarding the effect of Chamomile supplementation on some reproductive traits of ewes (Table. 4). As we expected, supplemented groups need a lower number of service/conception than control "this refers to the lower estrus period length in these supplemented groups". Conception rate (%) from total joined ewes was improved by Chamomile supplementation, it was (93.3%) in T2 followed by (80.0%) in T1 and the lower conception rate was in control group (73.3%). Also, the numbers of total and alive lambs born were higher in supplemented groups than control "it was more obvious in T2 than T1". Also, the results revealed that Chamomile supplementation increased birth weight, this increase was significant between T2 versus control (4.02 vs. 3.32 kg) however, it was not significant between T1 versus control "this result explains the obvious increase in body weight of ewes at the end of pregnancy".

Heat stress had major adverse effects on sheep reproduction, it led to increased maternal, fetal metabolism and increased reactive oxygen species production during gestation which consequently increased requirements for micronutrients, including antioxidants (Pedernera *et al.*, 2010), and it is well known that antioxidant deficiency is strongly correlated with poor fertility and reproduction in ruminants (Nayyar and Jindal, 2010). Reynolds *et al.*, (2010) reported that nutrient restriction during gestation which resulted from heat stress has a very bad effect on placental and fetal growth and development. Thus, the supplementation of feed additives that contains antioxidant substances such as Chamomile, which contains flavonoids, coumarins, aromatic oils, alpha bisabolol, azulene, and chamazulene that could alleviate the worse effect of heat stress and save fertility and reproduction.

Generally, our results revealed that Chamomile supplementation improved reproductive traits, that was evidenced by the improvement in conception rate and birth weight of produced lambs. These results agreed with those of El-Ghousein, (2010) on sheep, Mirzaei, (2011) on goats, they reported a significant improvement in reproductive performance as a result of Chamomile supplementation. Chamomile has antioxidant effect because it contains some ingredients that play as an antioxidant agents (Sepide and Alesaeidi, 2016). Our present results may be explained by the beneficial effect of Chamomile

supplementation on the alleviation of heat stress and oxidative stress adverse effects, maintaining acid base balance and antioxidant status, and improving feed intake and nutrients digestabilities (Zeid *et al.*, 2011, Sejian *et al.*, 2014 and El-Kholany *et al.*, 2015). Also, it improved immunity and detoxification of the aflatoxin (Tawfik *et al.* 2005).

Table (4): Effect of Chamomile supplementation on some reproductive traits of ewes.

Item	Treatment		
	Control	T1	T2
No. of ewes/group	15	15	15
No. of service/conception	2.15 ± 0.25	1.93 ± 0.17	1.71 ± 0.13
No. of ewes lambed	11	12	14
Conception rate (%) from mated ewes	84.6	85.7	100
Conception rate (%) from total joined ewes	73.3	80	93.3
No. of total lambs born	12	14	16
No. of alive lambs born	11	14	16
No. of total lambs produced/ewe lambed	1.09 ± 0.09	1.17 ± 0.11	1.14 ± 0.09
No. of lambs produced (alive)/ewe lambed	1.00 ± 0.00	1.17 ± 0.11	1.14 ± 0.10
Average birth weight (kg)	3.32 ^{b} ± 0.22	3.69 ^{ab} ± 0.12	4.02 ^{a} ± 0.20
Total birth weigh/ewe (kg)	3.62 ^{b} ± 0.19	4.30 ^{ab} ± 0.32	4.58 ^{a} ± 0.26

Control: Fed basal diet, T_1: Control + 0.5 gm chamomile flower /10 kg L.B.W/ day, T_2: Control + 1.0 gm chamomile flower /10 kg L.B.W/ day.
Values with different superscript letters in the same row are significantly different (P<0.05)

Thermal responses, respiratory activities and heat production measurements.

Results in Table (5) showed that means of rectal temperature were decreased significantly (P<0.05) in T2 compared to control group (39.23 vs. 39.75 C^{o}), however it did not differ significantly between T1 and control. Skin temperature was significantly (p<0.05) lower in both supplemented groups (T1,T2) than control. While, wool temperature did not differed among groups. At the same time, respiration rate values were decreased significantly in treated groups (32.50 in T1 and 32.78 in T2) than control group (40.60), however, opposite trend of results were obtained in gas volume/minute (GV) and tidal volume (TV). Metabolic rate (MR) and heat production (HP) values were significantly higher in T2 compared to both T1 and control groups. However, metabolic rate and heat production values were insignificantly higher in T1 compared to control.

Table (5): Effect of Chamomile supplementation on thermal responses, respiratory activities and heat production measurements.

Parameter	Treatment		
	Control	T_1	T_2
Rectal temp. (RT) C^{o}	39.75 ^{a} ± 0.11	39.48 ^{ab} ± 0.25	39.23 ^{b} ± 0.09
Skin temp. (ST) C^{o}	35.78 ^{a} ± 0.10	35.32 ^{b} ± 0.11	35.29 ^{b} ± 0.07
Wool temp. (WT) C^{o}	33.48 ± 0.05	33.46 ± 0.08	33.34 ± 0.08
Respiration rate (breathe/minute)	40.6 ^{a} ± 1.48	32.5 ^{b} ± 2.43	32.8 ^{b} ± 2.63
Gas volume (L/minute)	4.52 ± 0.54	4.70 ± 0.34	5.59 ± 0.56
Tidal volume (ml/breathe)	110.03 ^{b} ± 11.18	147.72 ^{a} ± 9.15	172.09 ^{a} ± 12.04
Metabolic rate (Kcal/day)	69.93 ^{b} ± 9.27	80.89 ^{b} ± 8.30	121.71 ^{a} ± 18.23
Heat production (Kcal/day)	72.08 ^{b} ± 7.66	81.67 ^{b} ± 6.06	106.17 ^{a} ± 10.74

Control: Fed basal diet, T_1: Control + 0.5 gm chamomile flower /10 kg L.B.W/ day, T_2: Control + 1.0 gm chamomile flower /10 kg L.B.W/ day.
Values with different superscript letters in the same row are significantly different, (P<0.05)

As we mentioned above, the present experiment was carried out during summer under heat stress conditions in upper Egypt region, which negatively affect the animal performance. There are some physiological responses of the animal to heat stress, of these, increasing respiration rate, sweating, vasodilation with increased blood flow to the skin surface, high rectal temperature, besides the alteration of water metabolism, these responses are associated with negative impacts on production and reproduction, in addition, heat stress can cause ruminal changes due to larger physiological changes within the animal (Tajimaa *et al.*, 2007). In our study, the lower respiration rate combined with high gas and tidal volumes, metabolic rate and heat production in Chamomile supplemented groups (T1,T2) revealed that these animals suffering less from heat stress and their physiological performance was improved or modulated compared to control group.

To our knowledge, very little data are available about the effect of Chamomile supplementation on gas exchange and heat production of farm animals. Our present results are in agreement with Watts, (2014) who reported that Chamomile addition to sheep diets alleviate the adverse effects of heat stress on the animal by improving the physiological and thermal responses. Chauhan *et al.*, (2014) and Hayder *et al.*, (2016) found that antioxidants supplementation during heat stress improves physiological responses of sheep in terms of RT, ST, RR, and HP, they explained this result by antioxidants supplementation with different doses improved the oxidative status and reduce the negative effects of heat stress. Furthermore, Sejian *et al.*, (2014) reported that dietary antioxidant "by mineral addition" protected ewes against heat stress by decreasing rectal, skin temperature and respiration rate.

Blood metabolites.

Results of some blood metabolites of ewes fed the experimental rations are presented in Table (6). Serum total protein, albumin, and globulin tended to increase with Chamomile supplementation but differences among groups were not significant, higher values were recorded in T2 followed by T1 and the lowest values were found in control group. Also, A/G ratio showed slight insignificant changes. Serum urea and creatinine concentrations showed some fluctuations among groups with insignificant differences. The same trend of results was noticed in liver function tests, AST and ALT concentrations were not changed significantly by chamomile supplementation. In addition, all values of these investigated blood metabolites were within the normal range (Maged, 2011).

Our results were supported by the results of Zeid *et al.*, (2011) on sheep, Maged, (2011) on goats and El-Kholany *et al.*, (2015) in cows. They reported that serum total protein, albumin and globulin concentrations were slightly increased (improved) by chamomile supplementation. Also, liver and kidney function were not significantly changed by chamomile supplementation. In the present study, the slight improvement in total protein, albumin and globulin values in chamomile supplemented groups may be attributed to the improved nitrogen absorption and reflects no pathological disturbance in the liver, also, chamomile supplementation did not cause health disorders which was evidenced by normal kidney and liver function tests (Zeid *et al.*, 2011).

Table (6): Effect of Chamomile supplementation on some blood metabolites.

Parameter	Treatment		
	Control	T1	T2
Total protein (g/dl)	6.65 ± 0.20	7.02 ± 0.15	7.03 ± 0.25
Albumin (g/dl)	3.59 ± 0.16	3.83 ± 0.14	3.77 ± 0.14
Globulin (g/dl)	3.06 ± 0.12	3.19 ± 0.11	3.26 ± 0.15
A/G ratio	1.19 ± 0.08	1.21 ± 0.07	1.17 ± 0.05
Urea (mg/dl)	33.8 ± 1.6	37.5 ± 1.7	37.7 ± 1.8
Createnine (mg/dl)	1.16 ± 0.03	1.21 ± 0.03	1.19 ± 0.04
AST, GOT (U/l)	36.9 ± 1.1	35.7 ± 1.2	38.9 ± 1.2
ALT, GPT (U/l)	34.5 ± 1.0	33.4 ± 1.2	33.2 ± 1.3

Control: Fed basal diet, T_1: Control + 0.5 gm chamomile flower /10 kg L.B.W/ day, T_2: Control + 1.0 gm chamomile flower /10 kg L.B.W/ day.
Values with different superscript letters in the same row are significantly different, ($P<0.05$)

CONCLUSION

From the obtained results, it could be concluded that supplementation of chamomile flowers as a feed additive during heat stress had a beneficial effect on reproductive performance by improving conception rate of ewes and birth weight of their produced lambs. The better improvement was observed with the high level of supplementation (1.0 gm chamomile flower /10 kg L.B.W/ day). Moreover, thermal responses, respiratory activities and heat production measurements of animals during heat stress were improved by the supplementation with no worse side effects on blood parameters.

REFERENCES

Barhane, M. and V. P. Singh (2002). Effect of feeding indigenous galactopoietics feed supplements on milk production in crossbred cows. Indian J. Anim. Sci. 72(7): 609-611.

Chauhan, S. S., P. Celi , B. J. Leury , I. J. Clarke and F. R. Dunshea. (2014). Dietary antioxidants at supranutritional doses improve oxidative status and reduce the negative effects of heat stress in sheep. J Anim Sci.; 92(8):3364-74.

Dash S., A. K. Chakravarty, A. Singh, A. Upadhyay, M. Singh, S. Yousuf (2016). Effect of heat stress on reproductive performances of dairy cattle and buffaloes. Veterinary World.;9(3):235-244.

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

El-Ghousein, S. S. (2010). Effect of some medicinal plants as feed additives on lactating awassi ewe performance, milk composition, lamb growth and relevant blood items. Egyptian J. Anim. Prod., 47 (1):37-49.

El-Hosseiny, H. M., S. M. Allam; S. A. El-Saadany, A. M. Abdel-Gawad and A. M. M. Zeid (2000). Medicinal herbs and plants as feed additives for animals. 2-Effect of using some medicinal herbs on growth performance of Zaraibi kids.proc. Conf. of Anim.prod. in the 21th century (18-20, Apri) Anim, prod. Res. Institute, Agric. Res. Center, Sakha, Kafr El-Sheikh, Egypt, pp:189-199.

El-Kholany, M. E., A. A. Mehany, G. A. Maged and A. A. El-Mowafy (2015). Performance and some rumen and blood parameters of Baladi cows fed rations supplemented with productive chamomile flowers during late pregnancy and lactating periods. J.Animal and Poultry Prod., Mansoura Univ., Vol. 6 (12): 705- 717.

El-Kholany, M. E., F. A. Elsayed, A. A. Mehany and G. A, Maged. (2017). Effect Of Dietary Supplementation Of Chamomile Flowers On Digestability And Productive Performance Of Baladi Growing Calves. J. Animal and Poultry Prod., Mansoura Univ., Vol. 8 (12): 459 - 465.

Hayder, M., F. E. Saba and A. A. K. Saleh (2016). Using different types of selenium to enhance Saidi and Farafra sheep productivity under heat stress in Middle Egypt. Egyptian Journal of Sheep & Goat Sciences, Vol. 11, No. 3, P: 215-226.

Linde, K., G. Riet, M. Hondras, A. Vickers., R. Saller and D. Melchart (2001). Systemic review of complementary therapies – an annotated bibliography. Part 2: Herbal medicine. BMC Compl. and Alternative Med. 1: 5.

Maged, G. A. (2004).Nutritional Studies on Small Ruminants. Master of Agriculture Science. Fac. of Agric., Mansoura Univ., Egypt.

Maged, G. A. (2011). Effect of medical herbs on production of dairy Zaraibi goats . Ph. D. Thesis, Fac. of Agric., Mansoura Univ., Egypt.

Ministry of Agriculture and land Reclamation of Egypt, (2015). Economic affairs sector, the Central Department of Agricultural economics.

Mirzaei, F. (2011). Effect of herbal feed additives on performance parameters of ruminants and especially on dairy goat; a Review. Report and Opinion; 3:(10); 126-136.

NRC, (1985). National research council, Nutritional requirements of sheep. 6th edition .

Ody, P. (1993). The complete medicinal herbal, dorling Kindersley, New York, pg. 47.

Pedernera, M., P. Celi, S.C. García, H.E. Salvin, I. Barchia and W. J. Fulkerson (2010). Effect of diet, energy balance and milk production on oxidative stress in earlylactating dairy cows grazing pasture. The Veterinary Journal 186, 352–357.

Reynolds, L. P., P. P. Borowicz, J. S. Caton, K. A. Vonnahme, J. S. Luther, D. S. Buchanan, S. A. Hafez, A. T. Grazul-Bilska, and D. A. Redmer. (2010). Utero-placental vascular development and placental function: An update. Int. J. Dev. Biol. 54:355–366.

Sejian, V., A. K. Singh, A. Sahoo and S. M. K. Naqvi. (2014). Effect of mineral mixture and antioxidant supplementation on growth, reproductive performance and adaptive capability of Malpura ewes subjected to heat stress. J. of Anim. Physiol. and Anim. Nutr. 98 72–83

Sepide, M. and S. Alesaeidi (2016). A systematic review study of therapeutic effects of Matricaria recuitta chamomile (chamomile), Vol.: 8 (9), 3024-3031.

Shehata, E. E., F. H. Abd El-Rasoul; M. E. Ahmed, F.F. Abou Ammou and R.El- Ahwall (2004). Effect of feeding a medicinal herb, chamomile flower on production and hygiene of goat milk production. Egypt. J. Nutr and Feeds, 7 : 109.

Shehata, E.E.; F.H. Abd El-Rasoul; F.F. Abou Ammou, M.E.Ahmed and A. M. Abdel-Gawad (2007). Effect of feeding some medicinal herb, Chamomile flowers, on some productive performance of Egyptian Zaraibi does and their new porn kids. Egyptian J. of Sheep and Goat Sci. 2(2);111-120.

Shwereb, A. M. (2012). Effect of different levels of plam kernel cake in lactating cow diets. Egyptian J. Nutrition and feeds , 15(3) : 435-449.

Singh, O., Z. Khanam, M. Srivastava and M. Kumar (2011). Chamomile (Matricaria chamomilla L.): An overview. Pharmacognosy Reviews, vol. 5, no. 9, p. 82-95.

Sivakumar, A., G. Singh and V. Varshney (2010). Antioxidants supplementation on acid base balance during heat stress in goats. Asian-Aust. J. Anim. Sci. Vol. 23, No. 11 : 1462 – 1468

Tajimaa, K., I. Nonakaa, K. Higuchia, N. Takusaria, M. Kuriharaa, A. Takenakaa, M. Mitsumoria, H. Kajikawaa and R. Aminov (2007). Influence of high temperature and humidity on rumen bacterial diversity in Holstein heifers. Anaerobe 13: 57-64.

Tawfik, S. A, M. E. Ahmed, E. I. Shehata and O. B. EL-Gazzar (2005). Effect of adding chamomile flowers to aflatoxins contaminated diet on growth performance, rumen parameters and some blood components of growing lamb's .4th Int. Sci. Conf., Mansoura. 251.

Watts C. (2014). Tackling stress in sheep through the addition of natural feed supplements and the monitoring of fecal bacterial levels. Journal of Animal Science; 77: 1120-1134.

Zangeneh, F. Z., M. Bagher, A. Ashraf, A. Akram and M. Kazem (2010). Effects of Chamomile extract on biochemical and clinical parameters in a rat model of polycystic ovary syndrome. J Reprod. Infertil.; 11(3): 169–174.

Zeid, A.M., M. K. Mohsen, M. A. Ibrahem and A. M. E. El-Kamhawy (2011). Effect of feeding rations supplemented with chamomile flowers and dried yeast on productive performance of sheep. J. Animal and Poultry Prod., Mansoura Univ., Vol. 2 (6): 167- 184.

تأثير استخدام زهرة البابونج (الكاموميل) كإضافة غذائية على الأداء التناسلي والاستجابات الفسيولوجية للنعاج الفرافرة أثناء ظروف الإجهاد الحراري

أيمن عربي خليل صالح و جمال فؤاد أبو زيد

قسم بحوث الأغنام والماعز، معهد بحوث الإنتاج الحيواني

أجريت هذه الدراسة لتقييم تأثير استخدام زهرة البابونج (الكاموميل) كإضافة غذائية على الأداء التناسلي والاستجابات الفسيولوجية للنعاج الفرافرة أثناء ظروف الإجهاد الحراري. أستُخدم في هذه الدراسة عدد خمسة وأربعون نعجة من سلالة الفرافرة تتراوح أعمارهم بين 2:4 سنوات بمتوسط وزن 42.1 ± 0.92 كيلو جرام وتم تقسيمهم بالتساوي إلى ثلاث مجموعات (15 نعجة لكل مجموعة) كالتالي: المجموعة الضابطة: غُذيت على العليقة الأساسية بدون أي إضافات, المعاملة الأولى: غُذيت على العليقة الأساسية + 0.5 جرام زهرة البابونج / 10 كجم من وزن الجسم / يوم , المعاملة الثانية: غُذيت على العليقة الأساسية + 1.0 جرام زهرة البابونج / 10 كجم من وزن الجسم / يوم. استمرت التجربة خلال موسم تناسل كامل حتى الولادة "خلال فصل الصيف" وتم خلالها تقييم الأداء التناسلي وبعض الاستجابات الفسيولوجية وبعض مقاييس الدم. أوضحت النتائج تحسن وزن الجسم للنعاج فى كل من المعاملة الأولى والثانية في نهاية فترة الحمل وبعد الولادة مقارنة بالمجموعة الضابطة. وفيما يتعلق بالأداء التناسلي, فقد كان عدد النعاج التي أظهرت الشبق في المجوعات المعاملة (الأولى والثانية) أعلى منها في المجموعة الضابطة. وقد أوضحت النتائج تحسن معدل الحمل عن طريق إضافة البابونج, فقد كان 93.3 ٪ في المعاملة الثانية يليها 80.0 ٪ في المعاملة الأولى بينما وجد أقل معدل حمل في المجموعة الضابطة (73.3 ٪). بالإضافة إلى ذلك، فقد ارتفع وزن الميلاد للحملان الناتجة من مجموعات النعاج المعاملة، وقد كانت هذه الزيادة معنوية بين المعاملة الثانية مقارنة بالمجموعة الضابطة (4.02 مقابل 3.32 كجم) فى حين أن هذه الزيادة لم تكن معنوية بين المعاملة الأولى والمجموعة الضابطة. وفيما يتعلق بالاستجابات الفسيولوجية، فقد انخفض كلا من درجة حرارة المستقيم والجلد لكل من المجموعتين المعاملتين بالكاموميل مقارنةً بالمجموعة الضابطة. في نفس الوقت، فقد انخفض معدل التنفس بشكل معنوي في المجموعات المعاملة (32.5 في المجموعة الأولى و 32.8 في المجموعة الثانية) مقارنة ب 40.6 فى المجموعة الضابطة، وعلى العكس من ذلك، فقد ارتفع كلا من حجم الغاز في الدقيقة وحجم التنفسه بشكل معنوي في المجموعتين المعاملتين مقارنة بالمجموعة الضابطة. أوضحت النتائج أيضا أن كلا من معدل الأيض والإنتاج الحراري كانا أعلى بشكل معنوي في المعاملة الثانية مقارنة بكلاً من المعاملة الأولى والمجموعة الضابطة. بالنسبة لتأثير لبعض مقاييس الدم, فقد اتجهت مستويات البروتين الكلي والألبومين والجلوبيولين في مصل الدم إلى الزيادة "ولكن بشكل غير معنوي" مع زيادة مستوى إضافة البابونج حيث سُجلت أعلى القيم في المعاملة الثانية تليها المعاملة الأولى وقد كانت القيم الأقل في المجموعة الضابطة. بالإضافة إلى ذلك، لم تختلف تركيزات اليوريا والكرياتينين وإنزيمات الكبد بالدم بشكل معنوي بين المجموعات وكانت جميع قيم مقاييس الدم المدروسة فى المستوى الطبيعي. نستنتج ونستخلص من خلال النتائج السابقة أن استخدام زهرة البابونج (الكاموميل) كإضافة غذائية في علائق النعاج له تأثير إيجابي على الأداء التناسلي وقد لوحظ أن هذا التحسن كان أعلى مع ارتفاع مستوى إضافة زهرة البابونج بالعليقة (1.0 غرام / 10 كجم من وزن الجسم / يوم). علاوة على ذلك فقد تحسنت الاستجابات الفسيولوجية للنعاج خلال ظروف الإجهاد الحراري باستخدام زهرة البابونج في حين لم تتأثر مقاييس الدم بشكل سلبي.