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Effect of Toxin Binder Supplemented to Friesian Cows Rations on Stress States and Their Reproductive Performance Under Summer Climatic Conditions in Delta Region

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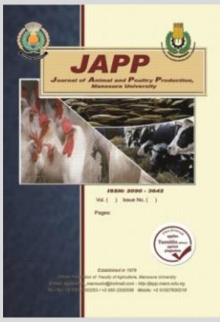

ABSTRACT

Twenty Holstein cows with an average of 540±17.59 kg LBW and 2-5 parities were used from beginning dry period to 120-days postpartum to study the effect of dietary bentonite and/or zeolite supplementation on reproductive performance under heat stress of Delta region. The experimental cows were distributed into four homogenous groups (5 cows each). All cows were fed a basal ration (BR) according to their production stage and body weight. The first group (G1) was fed (BR) only without any supplementation (control), otherwise groups G2, G3 and G4 were fed control diet plus 2 % bentonite, 1% bentonite and 1% zeolite or 2% zeolite of DM intake, respectively. The obtained results showed that dry matter intake, total proteins, albumin, Albumin/Globulin ratio, progesterone and birth weight of newborns were higher in treatment than in control groups. Rectal temperature, respiratory rate, the interval to 1st ovulation, oestrus and service, days open, and the number of services per conception were lower ($P<0.05$), while conception rate was higher ($P<0.05$) in treatment than un-supplemented groups. In conclusion, bentonite supplementation as an antitoxin to ration of lactating Holstein cows at a level of 2% of DM intake under summer months in Delta region had a positive impact on feed intake, health status, and reproductive parameters.

Keywords: Toxin binder, Friesian cows, heat stress, blood biochemicals, reproduction.

INTRODUCTION

The heat stress is one of the main environmental problems which affects livestock fertility and reducing newborn count (Jordan, 2003). Heat stress is one of the main factors that affect reproductive performance and uterine and ovarian health. Nutrition as dry matter intake, dietary protein and negative energy balance as well as.non nutritional factors like milk production, stage of lactation and ambient environment condition are considered main factors which affect reproductive performance (Ghavi *et al*., 2013). Heat stress is occurred by unbalance between heat gain and heat loss mechanism (Purwar *et al*., 2018), causing changes in hormonal secretions, enzymatic reactions and blood metabolites (Ganaie *et al*., 2013), leading to weak of growth, production and reproduction. The seasonal and environmental alteration may influence blood indices in livestock (Feldman *et al*., 2002).

Reproductive performance, fertility percentage and quality of embryo were affected negatively by heat stress (Girma *et al*., 2019).

Historically, the modelling of THI has been used in the prediction of heat stress in dairy cattle. Both animal and management factors affect heat load, animal factors as size, age and level of production, and management factors as cooling management (Lees,2017).The changes in environment circumstance like temperature, humidity, relative humidity, wind rainfall which consider like potential hazard which effects on animal production and growth (Piccione, *et al*., 2010). The increase in heat production occurs as a result of metabolic activity and loss heat out of radiation, conduction, convection evaporation of water from the skin and repertory system (Al-Mogbel *et al*., 2003). The feed intake was decreased when body temperature increased also; metabolism and body weight were decrease to help alleviate the heat imbalance (Johnson, 1980). The change in humidity condition and temperature consequently the cows are able to be adapted (Kadzere *et al*., 2002). Cows can make a balance of core body temperature and the upper limit air temperature ambient temperature between25.0–26.0°C (Berman *et al.*, 1985).

The heat exchange between cow body and the surrounding environment depends mainly on the ambient air temperature and relative humidity, also other elements like air movement and sunlight had a major role in inducing heat stress response in animals (West, 2003).

Environmental indices depend on meteorological factors such as temperature and humidity to calculate temperature humidity Index (THI), black Globe-Humidity Index (BGHI) and environmental Stress Index (ESI). The worst heat stress situations occur by the association of high air temperature and high relative humidity in the animals' environment (Herbut *et al*., 2018). There are two main methods to evaluate the environmental risk factors on animals. The first method depends on large scale temperature and humidity that indices expressed as absolute units. The second method expressed in °C (Wang

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et al., 2018). Hales *et al*.,(1996) summarized symptoms that happed on lactating cows under heat stress conditions with increased body temperature more than 102.6F˚ (normal < 101F˚), increased respiratory rate, panting more than 80 breaths per minute (35-45 normal), increased peripheral blood flow and sweating, reduced activity, feed intake and fertility levels then increased mortality. Parities rotation and heat stress effect on fertility lactating cows and growth and maturation of oocyte (Singh *et al*., 2013). During the hot season, lower fertility is due to decrees estrus under 80%, secretion of endometrial PGF-2α as a result of the high-temperature period (Bilb *et al*., 2008).

Heat stress increases anestrous and silent ovulation causes besides reducing the estrus period length in farm animals (Singh at al., 2013). Moreover, there is a problem with fertility when the body temperature exceeds 40°C, through disable follicular development (Roth *et al*., 2000).

Recently, both zeolite and bentonite are toxic additives that supplemented to livestock rations for reducing the negative effects of fungi toxins and improving metabolism. In this way, Mehany *et al.* (2019) found that DM intake significantly increased by supplemented 2% bentonite as DM intake of lactating Friesian cows. The animal well tolerated with zeolite supplemented diets, it supports to improve the health of animal and biomass production (Martin-Kleiner *et al*., 2001; Papaioannou *et al*., 2004). Zeolite becomes more effective when supplanted 15g/kg to concentrates but toxic bender affectivity decrease when the zeolite concentration increases to 25g/kg (Oguz and Kurtoglu 2000). Dietary supplementation with 4% zeolite increased milk and fat yields during the whole lactation period, compared to 2% zeolite and control diet (Ilić *et al*., 2011). Also, milk yield was increased by zeolite (200–400 g/cow/day). Milk fat and protein contents were not altered and all ruminal parameters were improved. When the level of zeolite exceeded 400 g/d/cow, all production and ruminal parameters were negatively altered (Khachlouf *et al*. 2018).

At moderate levels, However, non-significant effects of bentonite on the nutrients intakes, milk production, and milk composition was reported by Sumantri *et al* 2012.) with low or high levels of bentonite (0.25 or 2% of dry matter).

The gut is protected by adding bentonites to the diets because it binds aflatoxins from the digestive tract and thus reduce their absorption into the organism (Grant and Phillips, 1998; Phillips *et al*., 2002), which rapidly and preferentially bind. In that manner, adverse effect of aflatoxins on efficiency and liver function is minimized without marked defects in mineral metabolism of the animals (Schell *et al*., 1993a,b; Santurio *et al*., 1999).

The goal of this study was to detect the effects of toxic binders (zeolite, bentonite or their combination) on reproductive performance of Friesian cows under climate conditions of a summer month in Kafr el Shiekh Governorate, Egypt.

MATERIALS AND METHODS

This research was conducted at El_Karada Experimental Station, Kafr El-Sheikh province belonging to the Animal Production Research Institute, AgriculturalResearch Center, Egypt. Trial period studied between April and October 2018 (from the beginning dry period to conception service).

Animals and experimental groups:

Twenty dried Friesian cows at 3 weak prepartum until 120 days of the postpartum period within the 2nd to 5th parities, and with an average body weight of 540 ± 17.59 kg. Cows were distributed into four homogenous groups (5 cows each) under 40% shad. All experimental groups were fed basal ration (BR) contained concentrate feed mixture (CFM), corn silage (CS) and rice straw (RS).

Animals in the group 1 (G1) considered as a control group and were fed BR without any supplements, while the other groups were fed a control diet with 2% Bentonite (G2), 1% Bentonite+1% zeolite (G3) and 2% zeolite (G4) of dry matter intake. The experimental period lasted from 17/4/2018 to17/10/2018.

All cows were fed 40% CFM which was composed of wheat bran (27%), yellow maize (41%), uncorticated cottonseed meal (26%), molasses (4%), premix (1.5%) and salt (0.5%). Roughages included 35% CS and 25% RS in Table 1.

Table 1. Chemical analysis of different feedstuff (on dry matter basis) used in feeding cows.

Items	DM %	Composition of DM %					
		OM	CP	CF	EE	NFE	Ash
Feedstuffs							
CFM	90.76	92.33	16.58	12.68	3.07	60.00	7.67
CS	28.42	93.91	8.64	23.61	2.45	59.21	6.09
RS	91.15	83.59	2.56	31.79	1.09	48.15	16.41

The climatic condition and temperature-humidity index (THI):

Averages of maximum and minimum ambient temperature (Ta, the temperature of the air surrounding the animal), relative humidity (RH%, the air continent of moisture), and temperature-humidity index (THI) during the experimental period are presented in Table 2.

Table 2. Environmental conditions during the experimental periods.

Items	daily maximum temperature (Ta)	Relative humidity (RH %)	THI
Max.	34.69	63.10	86.60
Min.	30.20	47.61	79.44
Mean	32.45	58.32	82.90

The THI was calculated by using the formula of Mader *et al.* (2006): THI = (0.8 x T_{db}) + {(RH/100) x (T_{db}–14.4)} +46.4. Where: daily maximum temperature and RH: Relative humidity %. According to this formula, THI between 70-74 is an indication to heat stress, ≤74 is classified as alert, 74-79 as a danger, and 79-84 as severe heat stress.

Daily feeding schedule:

Experimental cows were fed according to NRC 1988 depending on body weight, milk production, stage of lactation and pregnancy status. The amount of feeds for each cow was adjusted weekly according to the change in milk production and body weight. The feeds were offered two times per day at 8 am. and 4 p.m. Rice straw was offered at 10 a.m. and 3 p.m. The water was available all time a day.

Physiological response parameters:

Physiological responses in terms of rectal temperature (RT), respiration rate (RR) and pulse rate (PR) were measure at 9 a.m. once/week through the experimental period. The RT was recorded using a thermometer inserted approximately 7.5 cm into the rectum, RR was measured by visual observation of flank movement for 60 s, while PR was palpated (touched with fingers) in superficial arteries when they are in soft tissue and can be pressed against a bony structure. After discovering the located an artery, hold it steady with the fingers then apply gentle pressure. To determine the rate accurately, count the pulse for one full minute. Judge the rhythm and quality by alternating pressure on the artery for another full minute.at 9.00 AM.

Blood samples:

Blood samples were collected started after two weak postpartum at 3 to 4-day intervals. The blood sampling continues until 120-day postpartum.after 4 hours from the morning feeding blood Samples were taken from the jugular vein of all cows by clean sterile needles in clean dry plastic tubes. Samples were left at room temperature for 2 hours to coagulate and then centrifuged at 3000 rpm for 15 min to separate serum, which was stored at -20 ^{o}C until analysis. Samples were obtained to determine the blood concentration of progesteroneP4 and cortisol concentrations were assayed by Radioimmunoassay (RIA) using Beckman coulter RIA progesterone and Beckman coulter RIA estradiol kits (ImmunoTECH, S.r.oRadiova 1-10277, Prague, Czech Republic) respectively, according to the procedures described in the catalogue enclosed with the kits. The inter- and intra- assay coefficients of variations were 8.66 and 8.15 for progesterone and 12.6 and 12.7 for cortisol, respectively. The average sensitivity was 9.58 ng/ml for progesterone and 1.46 ng/ml for cortisol.

(P4) for mentoring the ovarian activity and determine the concentration of total proteins, albumin, total lipids, and total cholesterol, and activity of alanine (ALT), and aspartate (AST) aminotransferases, alkaline phosphatase (ALP) and cortisol. Serum total proteins (Armstrong *et al*., 1964) and albumin (Doumas *et al*., 1971) were determined, while globulin was calculated by subtracting the values of albumin from corresponding values of total proteins for each sample. Total Lipids (Postma and SWroes, 1968), total cholesterol (Kostner *et al*., 1979), AST and ALT (Reitman and Frankel, 1957), alkaline phosphatase (Tietz , 1976) and cortisol (Shugaba *et al*., 2010), and progesterone (Nulsen *et al*., 1992) were determined. All serum biochemical parameters were done using commercial kits (Diagnostic System Laboratories, Inc., USA).

Reproductive parameters:

Standing behavior reproductive parameter was considered as the main sign of heat and cows which showed estrus after 45 days postpartum was artificially inseminated.

Some reproductive performances of the experimental cows were investigated. The interval from parturition to the first ovulation(when progesterone concentration in blood serum become more than 0.5 ng /ml), estrus, and services, number of services per conception, days open, and conception rate were recorded from calving up to 120 d postpartum. Cases, were checked twice daily for standing oestrus and pregnancy diagnose was detected by rectal palpation after 60 days from the last inseminations.

Statistical analysis:

Data were statistically analyzed by one way ANOVA using General Linear Model procedures (GLM) described in SAS User's Guide (SAS, Institute 2003). The significant differences among treatment means were separated by Duncan's new multiple range test (Duncan, 1955) at a level of P<0.05.

RESULTS AND DISCUSSION

Physiological responses:

Results in Table 3 show that all toxin binder additives significant (P<0.05) reduced the rectal temperature (RT), respiration rate (RR) and panting of cows in treatment groups as compared to control one, being the best in G4. These results indicated the positive impact of adding 2% zeolite in the diet on the physiological response of cows under heat stress condition. Exposure of animals to heat load leads to negative energy use that maintain homeostasis and increased the energy requirements of the animal (Ravagnolo and Misztal, 2000). Body temperature is considered as a good measure of heat stress. Stress is indicated by a shift away from core body temperature (Brown-Brandl *et al*., 2005). There is a relationship between RR and TA in two subsequent years under study. Brown-Brandl *et al.* (2005) noted that an upward shift in ambient temperature led to a rise in RR.

Also, RR increases with a hot climate. The slight increase in RR causes increase energy expenditure by approximately 7 %, whilst a substantial increase in RR may increase energy expenditure by 11 to 25 % (NRC, 1981).It is clear the good measure for heat stress in feedlot cows is a panting score (Gaughan and Mader, 2014). Panting allows for a visual assessment of the stress level of cattle (Young and kumer, 1993). During the moderate condition, cows can isolate their body from the thermal condition, however, if the ambient condition is at heat stress condition, the ability of cows to regulate thermal exchange was decreased so its body temperature increased (Verwoerd *et al*., 2006). When environmental conditions become hot, the control cows are unable to adapt versus a marked physiological response in treatment groups.

Table 3. Effect of experimental rations and heat stress on some biochemical in blood serum of cows during postpartum periods:

Item	Experimental group				SEM
	G1 Control	G2 Bentonite	G3 Bentonite+Zeolite	G4 Zeolite	
Respiration rate (Brea./min)	67.50^{a}	56.36^{b}	56.14^{b}	56.14^{b}	1.66
Pulse rate (Pulse/min)	66.40^{a}	66.12^{b}	65.88^{b}	65.60^{b}	1.85
Rectal temperature (^{o}C)	39.16^{a}	38.83^{b}	38.62^{b}	38.62^{b}	1.04

a;b: Means in the same row with different superscripts differ significantly at P< 0.05.

Reducing the physiological response parameters is related to the effect of the toxic binder for saving the plasma volume and blood viscosity to reduce the dehydration under hot stress to reduce the body heat losses (Seath and Miller, 1946).

Feed intake:

Feed intake by cows in experimental groups (Table 4) revealed that CFM and DM intakes significantly (P<0.05) increased in treatment groups in comparison with control one, being the highest in G2 received 2% bentonite, followed by G3. Increasing ambient climatic conditions leads to a decline in DM intake, thus reducing heat production (Brown-Brandl *et al*., 2005). Dry matter intake declines in lactating dairy cows subjected to continuous heat stress conditions. Feed intake decreases markedly when the ambient temperature exceeds 30 °C (NRC, 1981). First lactation cows showed lower feed intake in summer as opposed to winter (McDowell *et al*., 1976). In this way, Spiers *et al.* (2004) summarized that a shift of body temperature above 39 °C was required to alter feed intake. The strategies of cattle nutrition under hot conditions are focused on using diets include high energy (Gaughan *et al*., 2008, 2009), feed additives (Dunshea *et al*., 2017), probiotic as yeasts supplements (Crossland *et al*., 2019), antioxidants as minerals (Calamari *et al*., 2011) and Toxic binders to reduce hot loading (Mader *et al*., 1999). Because of hot conditions that decrease appetence and intake of cows, toxic binder additives affected on increasing DM intake with the same trend of Abd El-Baki *et al*. (2001), particularly in cows of G2 fed bentonite diets.

The natural clays like bentonite use as toxin binder in animals diets to improve feed intake (Salah *et al*., 1999; Salem *et al*., 2001). Feed intake was improved significantly with adding sodium bentonite to lamb diet which contains high concentrations (Colling *et al*., 1979).

Feed intake was increased by adding the normal clay to ruminant diets (May *et al*., 1988). However, Gutierrez (1999) found that feed intake was not affected when zeolite (1, 3, or 5%) was added to sheep concentrate feed mixture and feeding star grass *ad libitum*. Also, Johnson *et al*. (1988) reported that feed intake decreased by addition of natural clays. Aiad (1990) found that supplementation of bentonite, kaolin and tafla clays with 3% urea in sheep rations did not affect feed intake. Moreover, dry matter, organic matter, and feed components were not affected significantly by bentonite supplementation (AbedEl-baki *et al*., 2001; Salem, *et al*., 2001).

Table 4. Average daily feed intake (kg/head/day) by cows in the experimental groups.

Feed stuff	Experimental group				SEM
	G1 Control	G2 Bentonite	G3 Bentonite+ Zeolite	G4 Zeolite	
CFM	4.6^{c}	6.3^{a}	6.00^{ab}	5.7^{b}	0.02
CS	4.7	4.7	4.7	4.7	0.01
RS	5.4	5.4	5.4	5.4	0.02
Total DM intake	14.7^{c}	16.4^{a}	16.1^{ab}	15.8^{b}	0.17

a, b, c: Means in the same row with different superscripts differ significantly at P< 0.05.

Some blood biochemical:

Data in Table 5 showed that all toxic binders in G2, G3 and G4 significantly (P<0.05) increased concentrations of total proteins, albumin, total lipids, while decreased globulin and total cholesterol. Also, albumin/globulin ratio significantly (P<0.05) increased as a result of increasing albumin and decreasing globulin. Njidda *et al.* (2013) reported that blood biochemical composition considerably reflects the health status of the cattle. Several factors determine the composition of blood and that especially includes nutrition, management, stress and diseases. Heat stress is the major effect of climate change, it has a large influence on the blood biochemical composition. In agreement with the present results, Simona *et al.* (2018) found a significant increase in the concentration of total proteins, globulins and AL/GL ratio by supplementation of0.5 and 2%clinoptilolite to calf diet.

The observed increase in total protein and albumin in treatment groups may be due to improving protein digestibility through the protein enzymes and increasing microbial protein synthesis (Abdelmawla *et al*., 1998). Koubkova *et al.* (2002) suggested that total protein increases significantly during heat stress and gradually reduces as a result of gluconeogenesis. On the other hand, Salem *et al.* (2001) indicated a non-significant effect on albumin and globulin concentrations by bentonite treatments to the diet of growing lambs.

Table 5. The concentration of some biochemicals in blood serum of cows in experimental groups.

Parameters	Experimental group				SEM
	G1 Control	G2 Bentonite	G3 Bentonite+ Zeolite	G4 Zeolite	
Total proteins (g/dl)	6.62^{b}	6.75^{a}	6.70^{a}	6.69^{a}	0.21
Albumin (AL, g/dl)	2.75^{b}	3.01^{a}	2.97^{a}	2.98^{a}	0.10
Globulin (GL, g/dl)	3.87^{a}	3.74^{b}	3.74^{b}	3.72^{b}	0.14
AL/GL ratio	0.72^{b}	0.81^{a}	0.80^{a}	0.81^{a}	0.04
Total lipids (mg/dl)	385.89^{b}	394.70^{a}	394.02^{a}	393.90^{a}	8.67
Total cholesterol (mg/dl)	152.82^{a}	147.93^{b}	148.35^{b}	147.89^{b}	5.62

a;b: Means in the same row with different superscripts differ significantly at P< 0.05.

Cholesterol is a main component of lipoproteins, especially low-density lipoprotein and very-low-density lipoproteins (Colin Negrete*et al.*, 1996). Heat stress harms lipid metabolism (Wheelock *et al.,* 2010). The concentration of cholesterol significantly (P<0.05) decreased by toxic binders under heat stress condition. In this respect, Mujahid *et al.* (2009) indicated that heat stress leads to increased free radicals production mediates that oxidize mitochondrial proteins and lipids. On the other hand, Mohesn and Tawfik (2002) noted that toxic binder bentonite did not affect serum cholesterol of Angora goats. Moreover, zeolite supplementation to the diets with high contents of cholesterol exerts hypo-cholesterolemic effect (Sorokina *et al*., 2001).

Hormonal profile and enzyme activity:

Data shown in Table 6 indicated that toxic bender treatments significantly (P<0.05) decreased serum cortisol concentration and ALP activity while significantly (P<0.05) increased serum progesterone concentration. On the other side, the activity of AST and ALT were closely similar to the different groups. These results indicated that bentonite and zeolite additives didn't have any side effects on liver functions. Cortisol and progesterone are affected rapidly by heat loads. There are relationships between the high level of cortisol and both ovum and ovulation development (Shugaba *et al*., 2010). Moreover, alkaline phosphatase (ALP), ALT and AST are important biochemical parameters (Chaurasia *et al*., 2016).

Concentrations of AST and ALP may be due to enhancing the utilization of the amino acids for protein synthesis (Abdelmawla *et al*., 1998). Addition of toxic benders may lead to reduce the negative effect of hot stress on basal metabolic rate and glucocorticoids by modification secretions of thyroid and cortisol hormones.

Raise levels of blood cortisol could help to diagnose chronic stress on a long time (Ladewig, 2000). Moreover, stress induces hypercortisolemia can affect the number of circulating lymphocytes (Dhabhar, 2009). During heat stress, cows experience a heightened adrenocortical function, culminating in increased circulating concentrations of cortisol (De Rensis and Scaramuzzi, 2003). Stress stimuli affect cortisol levels (Christson& Johnson, 1972). Plasma progesterone concentrations were not affected by heat stress for short periods (Roth *et al.*, 2000), but the progesterone concentrations were affected negatively by long time exposure to heat stress that due to the impaired in CL function during luteal phase especially in summer than in winter (Howell *et al*., 1994). The ALT, AST and ALP activities increase in animals which expose to hot temperature (>25.17c°) compare with other group expose to cooled temperature (<12.85 c°) (Bahga, *et al* 2007), so the activity of ALT and ALP could be taken as an indicator for heat stress. The serum ALT and AST were significantly higher in heat stress Holstein bulls than others not stressed bulls (Li-Junjie, *et al*, 2001; Sang-Ruzi *et al*., 2002).

Table 6. The effect of experimental rations and heat stress on some hormones and enzymes in blood serum of cows during postpartum periods:

Parameter	Experimental group				SEM
	G1 Control	G2 Bentonite	G3 Bentonite+ Zeolite	G4 Zeolite	
Cortisol (ng/ ml)	1.69^{a}	1.56^{b}	1.57^{b}	1.59^{b}	0.01
Progesterone (ng/ml)	0.41^{b}	0.44^{a}	0.44^{a}	0.44^{a}	0.02
AST (U/I)	26.81	26.92	26.83	26.82	0.01
ALT (U/I)	6.40	6.46	6.41	6.41	0.86
ALP (U/I)	1.35^{a}	1.20^{b}	1.21^{b}	1.23^{b}	0.018

a;b: Means in the same row with different superscripts differ significantly at P< 0.05.

Reproductive performance:

Reproductive performance parameters shown in Table 7 showed that all toxic binders significantly (P<0.05) decreased postpartum first ovulation interval (PPOI), postpartum first oestrus interval (PPSI), postpartum first service interval (PPFSI), number of services/per conception (NSC), days open (DO), and conception rate as compared to control group. Also, treatments significantly (P<0.05) increased the birth weight of the newborn. The length intensity of estrus was affected negatively by heat stress also, the incidence of anestrus and silent ovulation were increased (Singhal*et al.,* 1984; Kadokawa, 2012, Singh *et al*., 2013;).When the cow body temperature exceeds 40°c so the cortisol secretion increase consequently the development of follicles and become not viable (Singh *et al.,* 2013, Roth *et al.,* 2000). The follicular growth until ovulation was suppressed because the LH receptors and follicular estradiol synthesis were decreased as results for heat stress when female goat exposed to 36.8°c and 70 % relative humidity for 48 h (Ozawa *et al*., 2005). Also, the granulosa cells aromatase activity and estrogen secretions decrease under heat stress conditions (Ozawa *et al*., 2005, Wolfenson *et al*., 2000). The decrease of estradiol secretion led to suppress signs of estrus, gonadotropins surge, ovulation transport of gamete and consequently reduced fertilization (Walfeson *et al*., 2000).

The low de synchronization endocrine activities especially pineal-hypothalamic-hypophyseal-gonadal axis as results for increase the buffalo's body temperature more than 2°C so the hormonal function was altered (Upadhay *et al*., 2009). The cause of the poor estrus expression in summertime in Indian buffaloes is due to a low level of estradiol (Upadhay *et al*., 2009). Heat stress on dairy animals led to decrease fertility by reduce oocyte growth and maturation, also increase circulating prolactin level which led to acyclicity and infertility (Singh *et al*., 2013). The high temperature in summer is considering the main reason for silent ovulation in 80% of estrus cycle consequently reduces fertility (Rutledge, 2001). The high temperature is led to increase secretion of PGF2α form endometrium, consequently reduce pregnancy maintenance which causes infertility (Bilby *et al*., 2008). The decrease of inhibin and increase of follicle-stimulating hormone (FSH) led to variation in follicle dynamic and depression dominant follicle this may be the cause of low fertility during summer and autumn (Roth *et al*., 2000; Khodaei-Motlagh *et al*., 2011).

Heat stress decrease conception rate from 40-60% in cooler time on the other hand it becomes 10-20% at the hot time in summer (Cavestany*et al.,* 1985). About 20-27% drop in conception rates (Chebel *et al*., 2004) or decrease in 90-day non-return rate to the first service in lactating dairy cows were recorded in summer (Al-Katanani, *et al.,* 1999). Pregnancy rates are changed (p<0.01) significantly between seasons. Roth *et al.,* (2000) who observed that pregnancy rates in spring and summer were 44 and 62%, respectively, when the averages of daily minimum temperature and daily THI were equal to or above 16.7°C and 72.9 respectively. Moreover, severe heat stress, only 10-20% of inseminations has resulted, in normal pregnancies, were also reported (Roth *et al.,* 2000). Oocytes of cows exposed to thermal stress lose their competence for fertilization and development to the blastocyst stage (Gendelman and Roth, 2012).

Table 7. The effect of experimental rations and heat stress on some fertility parameters on cows during postpartum periods

Item	Experimental group				SEM
	G1 Control	G2 Bentonite	G3 Bentonite+ Zeolite	G4 Zeolite	
PP 1st ovulation interval (day)	33.2[a]	31.6[a]	30.6[a]	32.6[a]	1.81
PP 1st estrus interval (day)	46.8[a]	43.2[b]	42.6[b]	44.6[ab]	3.02
PP 1st service interval (day)	72.2[a]	66.4[b]	66.2[b]	68.2[b]	2.03
Number of services/per conception	3.4[a]	2.0[b]	2.2[b]	2.4[b]	0.45
Days open (DO)	122.8[a]	115.6[b]	117.2[b]	117.2[b]	2.69
Conception rate	80[b]	100[a]	100[a]	100[a]	0.02
Birth weight of newborn (kg)	33.2[b]	33.2[a]	32.2[a]	31.4[ab]	1.50

a;b: Means in the same row with different superscripts differ significantly at P< 0.05.
PP: Postpartum

CONCLUSIONS

The use of toxic bender especially Bentonite at a level of 2% of DM has positive effects on feed intake and reproductive parameter by eliminating the negative effects of heat stress.

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تأثير مضادات السموم الفطرية المضافة لعلائق الأبقار الفريزيان على حالة الاجهاد الحرارى و الأداء التناسلى لها تحت الظروف المناخية الصيفية لأقليم الدلتا

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أستخدمت عشرون بقرة فريزيان متوسط أوزانها 540 ± 17.59 كجم من الموسم الثانى الى الخامس . بدايةً من بداية فترة الجفاف حتى نهاية 120 يومًا بعد الولادة ، لدراسة تأثير أضافتة مضادات السموم الفطرية (البنتونيت والزيوليت) لعلائق الأبقار الفريزيان على حالة الاجهاد الحرارى و الأداء التناسلى لها تحت الظروف المناخية لأقليم الدلتا . هذا و قد تم تقسيمها عشوائياً الى أربع مجموعات متشابهة (كل مجموعة تساوي 5). جميع الأبقار تغذت على العليقة الأساسية و المكونة من مخلوط علف مركز و سيلاج الذرة وقش الأرز. المجموعة الأولى لم تأخذ أى أضافته ، فى حين أضيف للمجموعات 2، 3 ، 4. 2٪ بنتونيت و 1٪ بنتونيت بالإضافة إلى 1٪ زيوليت أو 2٪ زيوليت على اساس المادة الجافة المأكولة على التوالي. أظهرت النتائج تحت ظروف الإجهاد الحراري أن المجموعات المعاملة كانت أعلى (P≤0.05) من من حيث الماكول من المادة الجافة و بنفس الاتجاه كانت درجة حرارة الجسم ، ومعدل التنفس ، والنبض ، البروتين الكلى، الألبيومين ، الدهون الكلية ، نسبه الالبيومين/جلوبيولين، البروجيستيرون. بينما أرتفعت المجموعة المقارنة معنويا عن باقى المجاميع المعاملة فى الجلوبيولينات، ، الكوليستيرول، الكورتيزول، أنزيم اللأكلين فوسفاتيز. بينما المجموعة المضاف لها 2% بنتونيت كانت الأفضل معنويا فى عدد الأيام المفتوحة. لذا نستنتج أن مضاد السموم الفطرية البنتونيت بمستوى 2% من المادة الجافة قد أدى لتخفيف الأثر البيئى للحرارة و الرطوبة النسبية بأقليم الدلتا مما كان له الأثر الأيجابي على الأداء التناسلى للأبقار الفريزيان.