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Seasonal Effects on Oxidative Stress Markers and Economic Traits in Egyptian Buffaloes during the Transition Period

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Abstract

FOURTEEN pluriparous pregnant Egyptian buffaloes weighing 450±25 kg on average were used. The animals were divided into two groups of seven animals each. The first group went into the transition period during the summer season (July, August, September, and October), while the second group underwent transition in the winter months of November, December, and January. The current study was set out to determine: 1) the seasonal effects (Where buffalo in transition) on some oxidative stress markers. 2) The seasonal effects on some economic productive and reproductive variables. 3) The correlation between oxidative stress markers and the studied traits. Results showed an increase in TAC, MDA, and SOD as oxidative stress markers ($p < 0.0001$) in response to the season of the year, time from calving (pre/post), and their interaction. The buffalo females that transited during the summer had longer ($P < 0.01$) days open and gestation length. The season of the year significantly affects the daily and total milk yield, lactation period. According to the current study, heat stress during transition period increased the buffalo oxidative stress, and negatively influenced the buffalo's reproductive performance and milk production traits. Therefore, to avoid the bad effects of heat stress on the buffalo breeding industry, it would be better to improve the animal's macro-environment by adopting strategies that limit the harmful effects of heat stress, minimizing monetary losses and to meet with SDG2 and SDG 13 concerning hunger and Climatic changes.

Keywords: Buffaloes, Season, Oxidative Stress, Reproduction and milk production, climate change.

Introduction

Buffalo plays a vital part in the farm economy of many countries, because of its efficient feed utilization and relatively low needs for livelihood [1].

The key feature that makes buffalo ideal is particularly characterized by its effective feed efficiency and comparatively low maintenance requirements [2, 3]. Buffalos are known to be the second largest source of milk production in the world, providing ∼15.14% of the global fresh milk production as reviewed by Borghese [4].

There is only one breed of Egyptian buffalo. Thus, the distinction between Egyptian buffalo types depend only on the region in which they are raised [5, 6]. Egypt's dairy industry depends heavily on the Egyptian buffalo, which provides 36% of the country's meat and 44% of its milk [7].

Egypt is a subtropical climate, where there are hot and humid periods. The reproductive health and milk yield features of the dairy animals subjected to heat stress might be impacted by climate change. This can result in food shortage, making it difficult for developing countries to achieve SDG2 (Zero Hunger) and SDG 13 (Climate Action).

As stated by Celi [8], Oxidative stress has been linked to HS in livestock, notably dairy buffalo [9, 10]. Furthermore, oxidative stress brought on by HS stimulates cellular and molecular reactions, including an imbalance in the synthesis of oxidants and antioxidants [11].

When oxidants and antioxidants are presented in unbalanced amounts, oxidative stress might occur. Mavangira and Sordillo [12] claimed that oxidative stress interferes with inflammatory responses; as it raises the risk of metabolic disorders. Additionally,

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Colakoglu [13] define antioxidants as compounds with the power to stop, lessen, or eliminate oxidative damage. OS biomarkers help protect the cell membrane from oxidative damage by speeding up the elimination of hydrogen and lipid peroxide. Since super oxide dismutase (SOD) catalyzes the conversion of superoxide into hydrogen peroxide, it is believed to be the body's first line of defense against prooxidants [8]. Younis [14] reported that excessive formation of plasma malondialdehyde (MDA) is a result of lipid peroxidation. Moreover, Smith and Risco [15] noted that dairy cows' transition period, lasts three weeks from the time of parturition to three weeks after. Dairy animals with a smooth transition phase have strong reproductive and productive performance. Poor transition, on the other hand, suggests hampered reproduction and compromised production, which costs livestock farmers a great loss in their revenues [16]. The marks of the transition period include fat mobilization, high levels of ketone bodies and non-esterified fatty acids, and negative energy balance (NEB). NEB speeds up metabolism, which raises the production of free radicals and necessitates the production of more antioxidant enzymes to break down free radicals [17]. Furthermore, oxidative stress during the transition period causes lipids, proteins, and DNA to undergo oxidative damage [12]. Increased oxidative stress is linked to early lactation in dairy animals [18, 19, and 20]. Fatty acid oxidation in the liver results in increased oxidative stress and the production of free radicals [21].

An animal's total antioxidant capacity (TAC) and lipid peroxidation's end product (MDA) represents the physiological equilibrium of the oxidative status during transition dairy animals. Accordingly, it was discovered that during the peri-partum phase, MDA increased right away in healthy cows [22].

Two of the most significant factors that might affect dairy farms' income are the milk production and fertility [23, 24]. Similarly, dairy farm income is greatly influenced by reproductive success [25, 26, and 27]. Various fertility measures, such as the number of services per conception, days open (DO), and calving interval (CI), are used to assess the reproductive performance of dairy cows [28]. The question of whether oxidative stress occurs during the transition phase impacts reproductive function and productive potential has drawn a lot of interest in recent years [29].

It's critical to understand if buffaloes' physiological and metabolic processes change with the seasons to lessen the negative consequences of heat stress and to prevent problems and losses regarding the value of cost. The current experiment was designed with consideration of the potential impacts of oxidative stress during the transitional period on fertility and production measures.

The possible effects of oxidative stress during the transitional phase were taken into account when designing the current experiment. To determine if these parameters differed during advanced pregnancy and early lactation, and if they were associated with the oxidative stress response, it was decided to estimate the levels of TAC, MDA, and SOD as indicators of oxidative status.

Material and Methods

Research place and objectives

The present investigation was conducted at the Ministry of Agriculture and Land Reclamations' Mehallet Moussa Experimental farm, Animal Production Research Institute, Agriculture Research Center. Mehallet Moussa Experimental Station is situated in the northern region of Egypt's Nile Delta, Kafr el-Sheikh governorate. This region is known for its long summers, short winters, and copious amounts of rainfall [Classification: BWh by Arnfield, [30]

The current study experimental work lasted for 11 months started from November 2021 to September 2022.

This study was set out to:

- Evaluate the seasonal effects (Where buffalo in transition: summer/winter) on some oxidative stress markers.
- Evaluate the seasonal effects (Where buffalo in transition: summer/winter) on some productive and reproductive variables.
- Find out the correlation between oxidative stress markers and the studied traits.

Field work

For the current study, fourteen pluriparous pregnant Egyptian buffalo cows from the first to the fifth parity, weighing 450 ± 25 kg, were selected. Each animal underwent a routine physical examination to ensure its reproductive suitness and general health. Each group consisted of seven animals. The first group entered the transition during the summer season, (July, August, September, and October), while the second group underwent transition in the winter months of November, December, and January.

Climatic conditions

Environmental data were extracted from local meteorological station at Kafr El-Sheikh governorate. Temperature humidity index (THI) was calculated based on recorded relative humidity (RH%), and air temperature (AT^{o}C) recording: Furthermore, as stated by Mader [31].

Buffalo dam's diet

Buffalo dams were fed Berseem (*Trifolium alexandrium*) when available (from December to

May), in addition to rice straw and different amounts of integrated concentrate feed mixtures. In the summer, (between June and November), buffalo dams were fed a concentrate mixture with a small amount of rice straw and clover. Water is available for buffaloes three times a day. In the stalls, animals may lick bricks of the mineral mixture.

Blood samples and analysis

Heparinized test tubes were used to collect the blood samples, which were then centrifuged for 15 minutes at 4000 rpm. .After that, the clear plasma was sucked and kept at -20°C until the blood component assay. Blood samples were collected from animals using the following system Every 15 days before birth (two months before the expected date of calving). Every week until 45 days post calving.

Biochemical studies

Determination of total antioxidant capacity (TAC)

To measure the anti-oxidative capacity, we determine the antioxidative reaction of the sample's with a predetermined quantity of exogenously given hydrogen peroxide (H2O2). Using a commercial kit (Biodiagnostic business, Egypt) as describes by Koracevic et al., [32]. Using a spectrophotometer, the absorbance was measured at 505 nm and computed as follows:

TAC (mM/L) = Blank absorbance (AB) - Blank absorbance (ASA) x 3.33.

Determination of lipid peroxidation (Malondialdehyde; MDA)

The breakdown of polyunsaturated fatty acids produces malondialdehyde (MDA), which is a useful indicator of the degree of lipid peroxidation. Their quantity is determined by measuring the lipid peroxidation products with thiobarbituric acid, using a commercial kit (Biodiagnostic business, Egypt) in compliance with [33, 34]. At a wavelength of 534 nm, the absorbance was measured with a spectrophotometer and computed as follows:

$$\text{MDA (nmol / ml)} = \frac{\textbf{Absorbance} \text{ of sample}}{\textbf{Absorbance} \text{ of standard}} \times 10$$

Determination of superoxide dismutase (SOD) activity

This assay depends on the enzyme's capacity to prevent the reduction to nitroblue tetrazolium dye caused by phenazine methosulphate.

SOD activity in plasma was determined according to Nishikimi [35] using a commercial kit (Biodiagnostic company, Egypt). The absorption was measured at 560 nm for 5 minutes at 25 ℃ using spectrophotometer and then SOD activity is calculated as follows:

$$\text{Percent inhibition} = \frac{\Delta \text{Absorbance of control} - \Delta \text{Absorbance of sample}}{\Delta \text{Absorbance of control}} \times 100$$

SOD activity (U/ml) = Percent inhibition × 3.75

Statistical analysis

The general linear model of SAS [36] was used to evaluate the data set. Differences between means were estimated using Duncan [37], and repeated measurements analysis was used to assess the data.

The statistical model was as follows:

$$Y_{ijk} = \mu + T_i + S_j + (TS)_{ij} + e_{ijk},$$

Where: Y_{ijk} is the observation on the k_{th} animals of the j_{th} the classes of seasons (summer and winter) in the i_{th} type of treatments (before and after of calving); μ the overall mean of studied trait; T_i the effect of the i_{th} treatments, i=1 (before of calving) to 2 (after of calving); S_j the effect of the j_{th} season, j=1 (summer) to 2 (winter); $(TD)_{ij}$ interaction between two fixed effects (Treatments and Seasons) and e_{ijk}: the effect of random error, associated with each observation assumed to be normally and independently distributed with 0 mean and variance I σ^2e.

Results

Environmental conditions

Environmental conditions in Egypt are typically ranged from hot-humid during summer to cold weather during winter. Throughout the experiment, the following variables were measured: maximum and minimum relative humidity (RH, %), ambient temperature (AT, °C), and average computed temperature humidity index (THI) during summer (season 1, from May-July), and winter; (season 2; from December to February) as shown in Table (1). In the current study maximum, minimum, and average ambient temperature (AT) and THI values were highly significant ($p<.0001$) affected by season of the year (summer/winter) as shown in Table (1). The maximum AT, THI during the summer season was around 39.9°C and 94.1, while the minimum AT, THI recorded in the summer were 21.3°C and 67.7. Based on the summer THI measurements, the late-gestation buffalo dams in the current study that went into transition during summer were under heat stress. The values recorded for the minimum temperature and THI in the winter season are around 10.3°C and 52.0, where the maximum values for the same indices for the winter season were 22.2 and 69.0 (Table 1).

Influence of season of the year on oxidative stress markers

Variations in the components of climatic conditions are known to result in an imbalance between the body's defences against free radicals and the synthesis of pro-oxidants. The results of the present research revealed that there was a significant increase (p<0.0001) in the components of oxidative stress (TAC, MDA, and SOD) concentrations when buffalo dams were in transition during the summer compared to winter (Table 2). Moreover, oxidative stress was imposed during the postpartum period, as seen by the notable increases in TAC (p<0.0001), MDA (p<0.001), and SOD (p<0.0001) in comparison to the peripartum interval (Table 2).

Influence of season of the year on gestation length, days open, and calving interval

In buffaloes, successful breeding must occur within 85-115 days of parturition to achieve a calving interval of 13-14 months [38]. In the current study, DO, GL, and CI are the economic characteristic determined to denote reproductive efficiency. The results in Figure (1) cleared that there are significant differences between seasons (summer/winter) where buffalo females were in the transition period on DO (P<0.0277) and GL (P<0.0007). The buffalo females that transited during the summer had longer DO and GL. However, a non-confirmed statistical rise in the CI between seasons where buffalo females were in the transition period as shown in Figure (1).

Correlation between oxidative stress indices and some reproductive traits of buffalo females transiting during summer/winter

During the summer, there was a substantial negative correlation (-0.22574) between SOD and CI and a strong negative correlation (-0.29304) between TAC and GL (Table 3a). However, When buffalo females were in winter transition, negative but significant associations were found between SOD and DO (-0.56532) and CI (-0.56008) as shown in Table (3b).

Influence of season of the year and oxidative stress on Egyptian buffalo milk production

Lactation is likely to cause a shift in the normal metabolism with increased energy demands that are elevated during the transition stage, leading to oxidative stress [39, 40]. The current study indicated that season of the year is significantly affecting the lactation period (P=0.0349), daily (P<0.0001) and total milk yield (P=0.0305) depending on whether it was summer or winter as illustrated in Table (4). The results indicate that milk production from summer calving's is 1506.69±12.25 kg with a lactation period of 205.03±5.40, while the winter calving's milk production is 1634.29±11.47 kg with a lactation period of 229.57±4.46. Moreover, only during the summer season, the oxidative stress marker (TAC) was correlated with total (0.34134), and daily (0.29254) milk yield (Tables 5a- 5b). However, no significant correlation between TAC, SOD and MDA and lactation period are recorded either for buffaloes went into transition during summer or winter.

Discussion

Environmental conditions

The results of the current study indicated that environmental elements (AT, RH, and THI) lead to heat stress during the harsh summer season (Table 1). This is clearly occurs when THI reaches between >68 and 72 [41]. The current findings concurred with those of Hady [42] in Egyptian buffaloes during summer. The THI indices recorded in the current study (Table 1) showed that buffaloes exposed to Egyptian summer during their transition period suffer from moderate heat stress (THI <80). Moreover, buffalo cows transiting during December to January were exposed to cold stress (THI **60.5),** as previously indicated by Omran (43). However, In China, where they have subtropical conditions, THI indices in spring, summer, and autumn are higher than those in winter, with the greatest value in summer [44].

Influence of season of the year on oxidative stress markers

Heat stress resulted in significant increase (p<0.0001) in TAC, MDA, and SOD concentrations when buffalo dams were in transition during the summer compared to the winter (Table 2). The current results are comparable with those of Sharma et al., [45], who observed that early lactation cows produced approximately twice as much MDA as much as advanced pregnancy. The metabolic demands of late pregnancy, parturition, and the commencement of lactation are expected to increase the formation of reactive oxygen species, resulting in oxidative stress that may increase disease vulnerability [46].

The current findings are in line with those of Saleh et al., [47], who noted that oxidative stress might be enforced during the peripartum period in cows (Balady) and crossbreds in the Egyptian oasis. Research on Murrah buffaloes revealed elevated MDA levels over the summer as reported by Lallawmkimi [48]. Also, Colakoglu [13] demonstrated that the transition periods of the summer dairy cows exhibited greater levels of MDA than the winter group. Also Li [44] reported that TAC was considerably greater in the summer in non-lactating buffalo.

In the present study, the interaction between season of the year and transition period has shown to exert a highly significant effects (P<0.0001), on TAC, MDA and SOD, as shown in (Table 2). In accordance with our results, transitory Murrah buffaloes during the summer had higher levels of MDA and SOD compared to winter [49, 50, and 51]. Thus, it is plausible to conclude that a rise in oxidative damage and the emergence of oxidizable particles were associated with the transition period. These changes in antioxidative capacities may lead to changes in hormone levels, which may then have an impact on postpartum reproductive activity in buffaloes, due to severe damage to follicular cells [52].

Influence of season of the year and oxidative stress on gestation length, days open, and calving interval

Huge economic losses are encountered in the dairy industry due to high incidence of repeat breeding (20-39%) and extended days open, where the female dairy animals fail to become pregnant [53]. Our results (Figure 1) were compatible with Ayad et al., [54], in Egyptian buffaloes that calving season had a highly significant effect on DO and GL. Dash et al., [55], indicated that in Murrah buffalo as the maximum depression in conception rate was in June, July and August where THI value rises above 75. Moreover, heat stress extended the number of DO by 61 days in comparison to the cold season [56]. Also, Oseni [57] observed that high THI in the summer leads to lower fertility indices. Even though, the female buffalo during the summer was attempting to counteract or lessen the impact of ROS; however, it may impair the reproductive performance due to an increase in smooth, inactive ovaries and a decrease in the quality and rate of in- vitro oocyte maturation [58].

Calving interval is a combination of both DO and GL. As shown in Figure (1), no notable influence of transitional season (summer / winter) on CI. This may indicate that Egyptian buffalo were able to manage their reproductive problems by coping with heat stress. Unlike our findings, buffaloes that calved in the cool season had better reproductive process than those that calve in the hot season, according to Sastry and Monograph [59]. Mehsana buffalos had longer calving intervals in the summer than in the winter [60, 61]. In Egyptian buffalo and their Italian crosses, heat stress resulted in longer calving intervals [62]. These findings could be explained by that summer heat stress is profoundly alters the physiology of buffalo dams, resulting in a drop in feed intake and an increase in body temperature [63]. The results of the current investigation were also supported by those of Saqib [64] in dairy buffaloes and Tsuchiya et al., [65] in Holstein cows.

Correlation between oxidative stress indices and some reproductive traits of buffalo females transition during summer/ winter

The data from the current study showed that seasonal variations (temperature and humidity) would affect the buffalo's blood oxidative stress indices activity and MDA levels during the transition period, and that the summer group experienced higher levels of oxidative stress than the winter cow group (Tables 3-a and 3-b). In addition, a substantial negative correlation (-0.22574) between SOD and CI and a strong negative correlation (-0.29304) between TAC and GL were observed from the current results (Table 3a) when buffalo transiting during summer. Nevertheless, buffalo females went in transition during winter showed a negative but significant associations between SOD and DO (-0.56532) and CI (-0.56008) Table (3b). This might be due to the rise in the need for energy and the lipolysis of bodily reserves, which raises the formation of free radicals and lowers antioxidant activity [63].

Influence of season of the year and oxidative stress on Egyptian buffalo milk production

Results of the current study are in concurrent with previous research implicating that season of the year significantly affects milk production and lactation period (Table4). In addition, only during the summer season, the oxidative stress marker (TAC) was correlated with total milk yield (0.34134), (Table 5a-b). The present findings concur with those of Omran and Fooda [66] in Egyptian buffalo. When dairy cows experienced heat stress in the summer, it results in a negative correlation between THI and milk yield [67]. Additionally, Chen et al., [68] observed a reduction in milk production during summertime in Holstein cows. Moreover, under HS, cows produced the least amount of milk throughout lactation [67]. Additionally, Tao et al., [69] claimed that HS reduces milk production by impairing the activity of mammary gland cells. While cows' mammary blood flow decreases to enhance cooling, their peripheral blood flow increases, both of which result in a lower milk output [70]. Heat stress also raises the lactate content and lowers the pH of the rumen fluid. Then, sub-acute ruminal acidosis result in decreased milk production [71].

The combined impacts of heat stress and global warming are predicted to increase the cost of cattle and buffalo in India to around 3.4 million tons, in 2020 [72], counteracting with SDG #2 (zero hunger).

Conclusion

It is possible to conclude that the female Egyptian buffalo went into transition in the summer season suffered from increased oxidative stress in addition to the stress of lactation and pregnancy. Consequently, the reproductive traits, and milk production that are practically associated with the economics of the dairy farm could be hindered. Therefore, it is sensible to supplement the buffalo females at late stages of pregnancy and during early lactation with a well-balanced ration that contains a sufficient quantity of antioxidants to ameliorate signs of heat stress during the summer. It is also advisable to interfere with other heat stress mitigation means for sustainable buffalo production industry, to better achieve the second and the thirteenth goals of the 2030 Agenda of Sustainable Development.

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Declaration of Competing Interest

The authors declare that there is no conflict of interest.

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TABLE 1. Seasonal variations in air temperature (AT, °C), relative humidity (RH; %), and temperature humidity index (THI) under the Egyptian conditions.

Item	Season of the year		
	Summer May-July	Winter December-February	*P*-value
Maximum Air Temperature (°C)	39.96±0.41^{a}	22.27±0.29^{b}	<.0001
Minimum Air Temperature (°C)	21.34±0.40^{a}	10.33±0.28^{b}	<.0001
Average Air Temperature (°C)	30.68±0.37^{a}	16.33±0.27^{b}	<.0001
Average Relative Humidity	62.87±0.84	61.65±0.60	0.2400^{Ns}
THI (MAX)	94.10±0.56^{a}	69.01±0.40^{b}	<.0001
THI (MIN)	67.74±0.57^{a}	52.06±0.41^{b}	<.0001
Average THI	80.92±0.53a	60.53±0.38b	<.0001

a, b: Means within the same row with different superscripts are significantly different (P<0.0001).

TABLE 2. Seasonal variations in Egyptian buffalo oxidative stress indicators during the transition period (LSM±SE).

Oxidative stress indicator	Summer	Winter	*P*-value	Time (before calving)	Time (After calving)	*P*-value	Summer &before calving	Summer & after calving	Winter & before calving	Winter & after calving	*P*-value
TAC	1.53± 0.02^{a}	0.96± 0.02^{b}	<.0001	1.06± 0.02^{b}	1.43± 0.03^{a}	<.0001	1.14± 0.02^{b}	1.66± 0.02^{a}	0.98± 0.02^{c}	0.95± 0.03^{d}	<.0001
MDA	37.78± 0.32^{a}	29.65± 0.38^{b}	<.0001	22.60± 0.31^{b}	34.74± 0.53^{a}	0.0010	36.69± 0.09^{b}	38.13± 0.42^{a}	32.52± 0.24^{c}	27.73± 0.41^{d}	<.0001
SOD	40.20± 0.58^{a}	35.62± 0.71^{b}	<.0001	31.32± 0.43^{b}	41.57± 0.44^{a}	<.0001	32.97± 0.49^{c}	42.52± 0.57^{a}	29.67± 0.56^{d}	39.59± 0.56^{b}	<.0001

a, b, c and d: Means within the same row with different superscripts are significantly different (P<0.0001)

TABLE 3a. Correlation between oxidative stress indices and some reproductive traits where buffalo females were in transition period during the summer season.

Trait	TAC(mmol/L	MDA(nmol/L)	SOD (U/ml)
Gestation Length (GL)	-0.29304 (0.0059)	0.00128 (0.9906)	-0.01878 (0.8629)
Days Open (DO)	-0.15178 (0.1605)	-0.06158 (0.5710)	-0.20216 (0.0604)
Calving Interval (CI)	-0.18244 (0.0908)	-0.00055 (0.9960)	-0.22574 (0.0355)

Correlation values for each two variables are shown with their significance level between parentheses

TABLE 3b. Correlation between oxidative stress indices and some reproductive traits where buffalo females were in transition period during the winter season

Trait	TAC (mmol/L	MDA (nmol/L)	SOD (U/ml)
Gestation Length (GL)	-0.10021 (0.5278)	0.16040 (0.3102)	-0.01329 (0.9334)
Days Open (DO)	0.28719 (0.1239)	-0.15607 (0.4102)	-0.56532 (0.0011)
Calving Interval (CI)	0.21683 (0.2498)	-0.09539 (0.6161)	-0.56008 (0.0013)

Correlation values for each two variables are shown with their significance level between parentheses.

TABLE 4. Influence of season of the year on some productive traits were buffalo dams in transition

Trait	Season of the year Summer	Winter	*P*-value
Lactation Period (LP)	205.03±5.40^{b}	229.57±4.46^{a}	0.0349
Total milk yield (TMY)	1506.69±12.25^{b}	1634.29±11.47^{a}	0.0305
Daily milk yield (DMY)	3.64±0.08^{b}	5.04±0.13^{a}	<.0001

a and b : Means within the same row with different superscripts are significantly different at different significance levels, Ns :not significant at (P<0.05).

TABLE 5a. Correlation between oxidative stress indices and some productive traits where buffalo females were in transition period during the summer season.

Trait	TAC	MDA	SOD
LP	0.05185 (0.6334)	0.08015 (0.4606)	0.12237 (0.2589)
TMY	0.34134 (0.0012)	0.02551 (0.8145)	0.13536 (0.2113)

Correlation values for each two variables are shown with their significance level between parentheses.

TABLE 5b. Correlation between oxidative stress indices and some productive traits where buffalo females were in transition period during the winter season.

Trait	TAC	MDA	SOD
LP	0.17967 (0.2549)	-0.15698 (0.3208)	0.02258 (0.8871)
TMY	0.03016 (0.8496)	-0.09765 (0.5384)	0.33137 (0.0321)

Correlation values for each two variables are shown with their significance level between parentheses

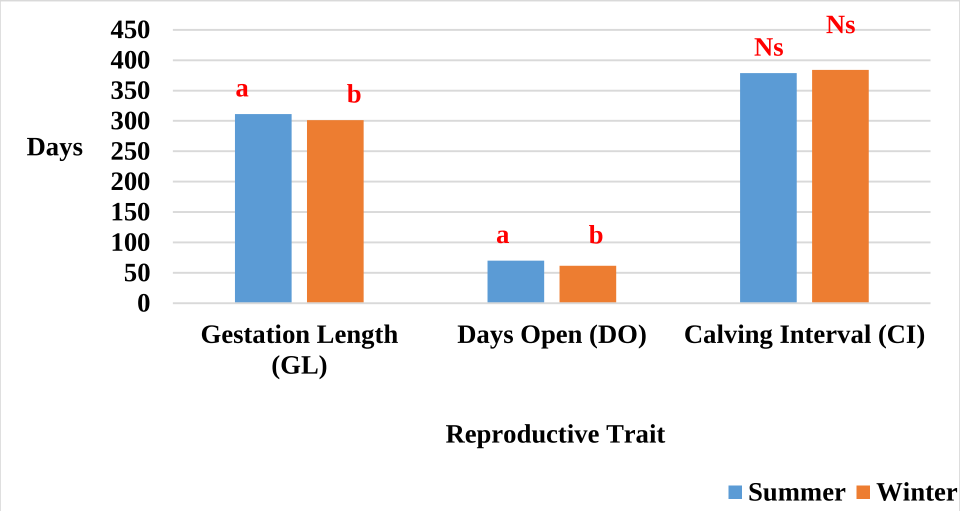

Fig. 1. Influence of season of the year on gestation length (GL, days), days open, and calving interval (days) of Egyptian buffalo females that were in transition during summer or winter

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علاقة الإجهاد الحرارى والتأكسدي وبعض الصفات الاقتصادية للجاموس المصرى خلال الفترة الانتقالية

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الملخص

فى هذه الدراسة تم استخدام أربعة عشر جاموسة مصرية متعددة الولادات خلال الثلاث اشهر الأخيرة من الحمل بمتوسط وزن ٤٥٠±٢٥ كجم، وتم تقسيم الإناث إلى مجموعتين من سبعة حيوانات لكل منهما. دخلت المجموعة الأولى الفترة الانتقالية خلال فصل الصيف (يوليو، أغسطس، سبتمبر، وأكتوبر)، بينما كانت الفترة الإنتقالية للمجموعة الثانية في أشهر الشتاء (نوفمبر، ديسمبر، وينابر). وتم حساب دليل الحرارة والرطوبة بناءً على البيانات المتحصل عليها من الأرصاد الجوية للمنطقة التى تم فيها إجراء التجارب العملية (محطة محلة موسى التجريبية). وكانت أهداف الدراسة تشمل تقييم ١) التأثيرات الموسمية أثناء الفترة الإنتقالية على بعض دلائل الإجهاد التأكسدى ٢) التأثيرات الموسمية أثناء الفترة الإنتقالية على بعض الصفات الإنتاجية والتناسلية المؤثرة إقتصاديا. ٣) مدى الإرتباط بين دلائل الإجهاد التأكسدى وبعض الصفات الإنتاجية والتناسلية المؤثرة إقتصاديا. وقد أظهرت النتائج أن موسم السنة كان له تأثير معنوى على قيم درجات الحرارة والرطوبة النسبية وكذلك دليل الحرارة والرطوبة. كما أشارت النتائج أيضًا إلى زيادة في مؤشرات الإجهاد التأكسدي إعتمادا على موسم السنة و الوقت قبل أو بعد الولادة، والتداخل بينهما. وتبين أن إناث الجاموس التى مرت بالفترة الإنتقالية خلال فصل الصيف كانت الفترة المفتوحة وفترة العشر أطول مقارنة بمثيلاتها خلال موسم الشتاء. وكذلك كان لموسم السنة تأثير كبير على إنتاج الحليب اليومي والكلي، وفترة إنتاج اللبن. وبناء عليه لتفادى التأثيرات السلبية للإجهاد الحرارى الواقع على أداء الجاموس يجب تحسين البيئة المحيطة بالحيوانات من خلال تبني الاستراتيجيات للحد من التأثيرات الضارة للإجهاد الحراري، وبالتالي تقليل الخسائر المالية والتغلب على تحديات استدامة الإنتاجية للجاموس.

الكلمات الدالة: الجاموس، الموسم، الإجهاد التأكسدي، التناسل، إنتاج اللبن.