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WATER BUFFALOES PRODUCTIVE PERFORMANCE IN EGYPT AS AFFECTED BY SEASON

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ABSTRACT: The present study includes 20 lactating buffaloes to estimate the effects of calving season and growth stage on milk production performance. In winter a total of 10 winter calving buffaloes (WCB) were assigned to two groups: (a) growing lactating buffaloes (GLBW, n = 7) and (b) mature lactating buffaloes (MLBW, n = 3). As well as, in summer, a total of 10 summer calving buffaloes (SCB) were assigned into two groups: (a) growing lactating buffaloes (GLBS, n = 4), (b) mature lactating buffaloes (MLBS, n = 6). Milk samples were collected weekly from each animal. Tre was measured and blood samples were collected from animals of each group at test day till the end of lactation period. Plasma samples were stored until subsequent analysis for ALT, AST, ALP, Albumin, Total protein, Cholesterol, and Triglycerides levels. Data were statistically analyzed using SPSS program to find out the variance between season of calving and between growing stages. Results indicate that, THI values were higher than 70 in summer and less than 70 in winter. Tre was not affected significantly by Parity and prevailing environmental conditions. SC buffaloes produced most of their milk in winter when Ta was almost being around the thermoneutral zone and therefore produced more milk than WC buffaloes. Mature buffaloes as well as produced more milk than growing buffaloes. SC had longer lactation period than WC buffaloes. Milk protein % was significantly higher in SC than WC buffaloes, whereas, milk lactose, fat and TS % did not differs between WC and SC buffaloes. ALT was significantly higher in SC than WC buffaloes. MSC buffaloes showed significantly higher ALT than growing buffaloes in both summer and winter. AST and ALP showed no significant differences. TP and globulin were significantly higher in SC than WC buffaloes with no significant between growing and mature buffaloes. Yet, albumin was not significantly differed between WC and SC buffaloes. A/G ratio was within normal values and did not differ significantly between groups or subgroups. In general, WC produced higher milk and milk components than SC buffaloes. MLB produced more milk and milk components within calving season. Plasma ALT, AST and ALP levels followed milk production in all groups.

INTRODUCTION:

Water buffaloes are the main dairy animals in Egypt and their milk is preferred by consumers to cattle or sheep milk.

Buffaloes are sensitive to weather changes, and adverse climatic conditions are hazardous to buffalo's productive performance. Marai *et al.*, (2002, 2006); and Marai and Habeeb (2010) showed that the effect of elevated ambient temperature reduce the animal appetite and feed intake, impaired reproduction and showed down growth. The present study was therefore carried out to estimate how much would milk production be affected beside the functional state of some principal organs by climate changes and the exposure to high ambient and low ambient temperatures in summer and winter.

MATERIALS AND METHODS:

Buffaloes representing 4 parities were kept in open yard (30×70 m^2) at Mostorod Research farm belonging to Animal Production Dept., Faculty of Agriculture, Al-Azhar Univ. Ambient temperature ranged between 0 and 31°C in winter and between 22 and 40 °C in summer. Relative humidity was ≤100 % in summer and winter. Light darkness ratio was naturally around12 hours. Mean animal weights were 441.6, 540.8, 631.8 and 629.8 kg for the 1^{st}, 2^{nd}, 3^{rd}, and 4^{th} parities respectively. Animals were fed concentrate fed mixture and berseem (*Trifolium alexandrinum*) according to Ghoneim (1967). The buffaloes were divided into two lactating groups; (a) growing (GLB, n=7) and (b) mature (MLB, n=3) in winter delivering buffaloes and these were farther divided into (a) growing lactating buffaloes, including 1^{st} and 2^{nd} parities and mature lactating buffaloes including 3^{rd} and 4^{th} parities. Milk yield of each buffalo was weighed and samples of 20 ml were collected twice daily at weekly intervals and preserved in plastic sterilized vials with 2 drops of potassium dichromate till assayed. Blood samples were also collected from the jugular vein in heparinized vials. Plasma samples were immediately separated and were preserved under deep freezer at 20 °C until estimation of ALT, AST, ALP, TP, Albumin, Cholesterol, and Triglycerides (TG). Three lactation stages were included: 1^{st} stage (pre-lactation) ≤ 100 days, 2^{nd} stage (mid-lactation) ≥ 101 to ≥ 200 days and 3^{rd} stage (late-lactation) ≥ 200 days.

Rectal temperature degrees (Tre) were measured at 10 am at monthly intervals for all experimental animals.

In summer another 10 lactating buffaloes were assigned to two groups (a) growing lactating buffaloes (GLB, n=4) and (b) mature lactating buffaloes (MLB, n=6). Rectal temperature degrees were measured. Blood samples were collected and treated as mentioned previously in winter.

Liver functions-indicating enzymes ALT, AST were estimated calorimetrically (Reitman and Frankel, 1957).

Albumin, alkalin phosphatase, and total protein were assessed calorimetrically according to Doumas, (1971); Belfield and Goldberg, 1971; and Gornal *et al*., (1949) in respective order. Cholesterol and Triglycerides were determined calorimetrically according to Allain *et al*., (1974) and Fassati and Prencipe (1982) respectively.

Milk components (fat, protein, lactose, total solids, and solids not fat) were estimated by Milko Scan 130 tester type: 10900 based on infrared spectroscopy (AOAC, 1990; and Kaylegian *et al*., 2009).

The 7% fat corrected milk yield (FCMY) values were calculated by the formula: FCMY (kg) = 0.28 × MY (kg) + 10.34 × milk fat (kg), according to Tyrrell and Reid (1965).

Meteorological data were obtained from central laboratory of agricultural climate. Temperature humidity index was calculated using the formula of Amundson *et al*., (2006):

$$THI = 0.8 \times Ta\,°C + \{(RH\,\%) \times (Ta\,°C - 14.4) / 100)\} + 46.4.$$

Where; Ta °C is the ambient temperature (°C), and RH is the relative humidity (RH %) / 100.

Statistical analysis: SPSS Program was used in data analysis (SPSS, 1999). Two-ways analysis of variance was used to test the effect of season within different growing stages in lactating buffaloes.

RESULTS AND DISCUSSION:

Meteorological data: A glimpse at Table (1) reveals that ambient temperature ranged between 5 and 25°C in winter and between 21 and 37°C in summer. THI values were higher than 70 in summer and less than 70 in winter. THI values of 68 considered the upper limit of dairy cattle comfort zone (Marai and Habeeb, 2010 and Johnson *et al*., 1989). Temperature humidity index value of 74 to 78 is considered hazardous and represents an alert condition for animals (Abd El-Ghany *et al*., 2010).

Table (1): Means of ambient temperature (°C), relative humidity (%) and temperature humidity index during the experimental period.

Season	Month	Ambient Temperature (°C)			Relative Humidity (%)			THI Average
		High	Low	Average	High	Low	Average	
Winter	Jan-2008	20	5	12.2	100	11	64.0	54.7
	Feb-2008	25	5	13.9	100	23	63.6	57.2
	Mar-08	38	10	20.6	94	6	49.0	65.9
	Apr-2008	40	12	22.3	88	6	49.4	68.1
Summer	May-2008	37	15	24.9	88	11	46.5	71.3
	Jun-2008	40	20	28.9	88	4	48.9	76.6
	Jul-2008	37	22	29.1	100	18	58.2	78.2
	Aug-2008	37	21	30.0	94	22	59.4	79.6
	Sep-2008	38	21	28.7	89	17	55.8	77.4
	Oct-2008	36	16	23.6	94	19	61.3	70.9
Winter	Nov-08	28	13	20.7	94	23	58.1	66.6
	Dec-2008	31	10	17.2	94	16	58.8	61.8
	Jan-2009	25	7	15.7	100	4	53.4	59.7
	Feb-2009	28	10	16.6	88	12	46.3	60.8
	Mar-2009	33	8	17.5	100	7	47.8	61.9
	Apr-2009	37	13	22.0	100	10	49.5	67.7
Summer	May-2009	40	0	24.4	88	13	47.5	70.7
	Jun-2009	40	20	29.8	100	4	45.6	77.2
	Jul-2009	38	22	30.0	100	21	57.3	79.3

Rectal temperature: Table (2) shows that mean Tres were 38.6 and 38.5 °C in winter calving (WC) and summer calving (SC) buffaloes respectively and being with no significant differences. Mean Tres in Growing winter calving (GWC) buffaloes and Mature winter calving (MWC) buffaloes were 38.5 and 38.8 °C respectively with no significant difference. Mean Tres in Growing summer-calving (GSC) buffaloes and mature summer calving (MSC) buffaloes was 38.5. This result indicates that Tre was not affected significantly by Parity and prevailing environmental conditions, which conforms to the findings of Tanaka *et al.*, (2007). The relatively higher Tre in WC buffaloes may be ascribed to the long term exposure to the worm climate since most of the lactation period was in summer. Also, lactating buffaloes are more sensitive to high Ta because they expend more energy besides, they possess small number of sweat glands in their skin (Ahmad and Tariq, 2010).

Table (2): Means ± standard errors of rectal temperature (°C) in growing and mature buffaloes calving in winter and summer.

Variable	Calving Season				P
Item	Winter Calving		Summer Calving		P1
M ± SE	38.62 ± 0.78		38.535 ± 0.81		NS
Growing Stage					
	Growing	Mature	Growing	Mature	P2
M ± SE	38.58± 0.07	38.77±0.17	38.53±0.10	38.54±0.11	NS

Where: M= Mean, SE= Standard error, P= Probability level of significance, P= Probability level of significance for the effect of calving season, P2= Probability level of significance for the effect of growing stage, NS= Non significant (P > 0.05), * = Significant (P ≤ 0.05), **= highly significant (P ≤ 0.01).

Milk Yield: Highly significant (P ≤ 0.01) differences between the averages of daily milk yield in WC and SC buffaloes were found (Table, 3). Such results could be attributed to the fact that summer calving buffaloes produced most of their milk in winter when Ta was almost being around the thermoneutral zone and therefore produced more milk than WC buffaloes. Mature buffaloes as well produced more milk than growing buffaloes which may be referred to that growth expands a great proportion of energy which would otherwise be used in milk production. Besides, that mature buffaloes possess more secreting milk glands and well developed udders. These results conform with those of Mourad *et al.*, (1990 and 1991) and Ueno *et al.*, (1999).

Table (3): Means ± standard errors of milk parameters in growing and mature buffaloes calving in winter and summer.

Parameter	Variable	Calving Season				P
Daily milk yield average (kg)	Item	Winter Calving		Summer Calving		P1
	M±SE	3.10±0.35		4.68± 0.33		
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	2.77 ± 0.40^{B}	3.88 ± 0.59^{AB}	3.92 ± 0.23^{AB}	5.18 ± 0.48^{A}	**
Lactation period (day)	Item	Winter Calving		Summer Calving		P1
	M±SE	229.60±16.95		282.04±11.28		*
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	242.57 ± 21.24^{b}	199.33 ± 22.23^{Bb}	260.50 ± 25.33^{AaBb}	296.40 ± 4.72^{Aa}	*
7% FCMY	Item	Winter Calving		Summer Calving		P1
	M±SE	553.59±71.80		1093±98.24		**
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	547.3 ± 103.1^{Bb}	568.3 ± 51.5^{Bb}	848.4 ± 132.4^{b}	1256.1 ± 93.0^{Aa}	**
Milk fat %	Item	Winter Calving		Summer Calving		P1
	M±SE	5.07±0.19		5.26±0.15		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	5.06±0.22	4.62±0.39	5.23±0.24	5.27±0.20	NS
Milk Protein %	Item	Winter Calving		Summer Calving		P1
	M±SE	3.31±0.11		3.45±0.05		*
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	3.32 ± 0.14^{AaBb}	2.28 ± 0.02^{b}	3.48 ± 0.13^{a}	3.43 ± 0.04^{Aa}	*
Lactose %	Item	Winter Calving		Summer Calving		P1
	M±SE	4.72±0.07		4.63±0.12		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	4.70±0.10	4.76±0.02	4.48±0.02	4.74±0.03	NS

Cont. Table (3):

TS %	Item	Winter Calving		Summer Calving		P1
	M±SE	13.62±0.28		14.06±0.18		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	13.67 ± 0.4^{AB}	13.53 ± 0.17^{B}	14.18 ± 0.41^{AB}	13.99 ± 0.17^{A}	*
SNF %	Item	Winter Calving		Summer Calving		P1
	M±SE	8.02±0.12		8:08±0.84		*
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	8.02 ± 0.25^{AaBb}	8.04 ± 0.23^{Bb}	7.96 ± 0.12^{b}	8.16 ± 0.05^{Aa}	*

Lactation period: Table (3) indicated that lactation periods were affected significantly ($P \leq 0.05$) by calving season and growing stage where summer calving had longer lactation period (282.0 day) than winter calving (229.6 day). Growing buffaloes had longer lactation period in winter (242.6 day) than mature buffaloes (199.3 day), while in summer the opposite was noticed where mature had longer (296.4 day) lactation than growing buffaloes (260.5 day). Khalil (2005) stated that metabolism increases under thermoneutral temperature there was an interaction between thermoneutrality and stage of growing which explain the preceding results.

Total milk yield and 7% fat corrected milk yield: The average total milk yield showed significantly ($P \leq 0.01$) higher values in summer calving buffaloes than in winter calving buffaloes (Table, 3). Growing and mature summer-calving buffaloes had higher ($P \leq 0.01$) total milk yield than winter calving growing and mature buffaloes. Maturation of buffaloes induces maturation of milk secretory organs which reflect parity and the development of the udder physiological functions and udder capacity to produce milk till maturation is complete (Mourad and Rashwan , 2001 and Javed *et al.*, 2009). The corresponding averages of 7 % fat corrected milk of either WC or SC showed differences being highly significant ($P \leq 0.01$) between summer and winter calving and between growing and mature buffaloes. These remarkable differences may be referred to higher milk yield and milk fat % in SC buffaloes.

Milk components: Milk protein % was significantly ($P \leq 0.05$) higher in SC than WC buffaloes, while milk lactose %, milk fat % and milk total solids did not differ between winter and summer calving buffaloes. Solids not fat was significantly ($P \leq 0.05$) higher in SC than WC buffaloes. The seasonal variation in milk components which might be found in some European countries was not clear in most of the milk component of buffaloes under the Egyptian conditions. This could be ascribed to differences in Ta and differences and light darkness ratio (Table, 3).

Biochemical Parameters:

Data in Table (4) indicated that Alanine aminotransferase (ALT) was significantly ($P \leq 0.01$) higher in summer calving (60 U/l) than in WC buffaloes (47 U/l). Mature SC buffaloes also showed significantly ($P \leq 0.01$) higher ALT (61 U/l) than the growing buffaloes in either summer or winter. Growing stage showed a significant ($P \leq 0.01$) effect on ALT, Table (4): Means ± standard errors of biochemical parameters in growing and mature buffaloes calving in winter and summer.

Parameter	Variable	Calving Season				P
ALT (U/l)	Item	Winter Calving		Summer Calving		P1
	M±SE	47±2.0		60±3.1		**
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	47±2.2^{B}	49±1.86^{B}	58±5.91^{AB}	61±3.68^{A}	**
AST (U/l)	Item	Winter Calving		Summer Calving		P1
	M±SE	130±3.9		134±5.4		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	128.6±5.4	132±4.4	134±7.4	135±8.2	NS
ALP (U/l)	Item	Winter Calving		Summer Calving		P1
	M±SE	132±10.49		136±4.4		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	131.54±13.1	131.91±24.16	135.10±3.54	136.03±5.75	NS
TP (g/dl)	Item	Winter Calving		Summer Calving		P1
	M±SE	7.6±0.2		8.3±0.1		*
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	7.80±0.23	8.05±0.29	8.13±0.29	8.43±0.15	NS
Albumin (g/dl)	Item	Winter Calving		Summer Calving		P1
	M±SE	3.59±0.05		3.54±0.06		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	3.59±0.06	3.60±0.06	3.57±0.08	3.51±0.10	NS
Globulin (g/dl)	Item	Winter Calving		Summer Calving		P1
	M±SE	4.17±0.1		4.59±0.2		*
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	4.21±0.1^{b}	4.07±0.3^{b}	4.11±0.14^{b}	4.91±0.18^{a}	*
A/G ratio	Item	Winter Calving		Summer Calving		P1
	M±SE	0.86 ±0.02		0.80±0.03		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	0.85±0.03	0.88±0.01	0.84±0.04	0.77±0.03	NS
Cholesterol (mg/dl)	Item	Winter Calving		Summer Calving		P1
	M±SE	82.31±2.1		86.30±2.1		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	82.27±2.6	82.39±3.9	86.83±3.3	85.96±3.0	NS
TG (mg/dl)	Item	Winter Calving		Summer Calving		P1
	M±SE	33.84±1.44		38.40±3.45		NS
		Growing Stage				
		Growing	Mature	Growing	Mature	P2
	M±SE	33.77±3.3	34.03±5.2	36.05±1.5	39.97±5.8	NS

most probably ascribed to its higher level in MSC buffaloes.

Aspartate aminotransferase (AST) and Alkaline phosphatase (ALP) showed no significant differences due to either season of calving or to growing stage (Table, 4). Boots *et al.*, (1970); Koubkova *et al.*, (2002); and Rasooli *et al.*, (2004) stated that increase in Ta enhanced ALT activities in cattle. On the other hand Abo El-Nor *et al.*, (2007) and Sobeich *et al.*, (2008) reported that enzymatic transaminase activity may increase in response to higher metabolism which normally accompanies lactation.

Plasma Proteins:

Total proteins in plasma were significantly ($P \leq 0.05$) higher in summer calving buffaloes (8.3 g/dl) than winter calving buffaloes (7.6 g/dl). Stage of maturity showed no significant effect between growing and mature buffaloes. Albumin as well was not significantly differed between winter-calving and summer-calving buffaloes or between growing and mature animals. Globulin however, was significantly higher in summer calving (4.59 g/dl) buffaloes compared to winter calving (4.17). Also, mature summer-calving buffaloes had significantly ($P \leq 0.05$) (4.91 g/dl) higher plasma globulin than the other 3 growing and mature groups. A/G ratio was within normal values and did not differ significantly between groups and subgroups (Table, 4)., these results are not in agreement with those previously reported by Shafie and Badreldin (1962), Yousef, (1990) and Gudev *et al.*, (2007), but they conform with the findings of Chaiyabuter *et al.*, (1987) and Nessim, (2004), who found that total protein levels were higher in summer than in winter. Exposure to summer high Ta causes initial hemo-concentration followed by hemodilution (Gudev *et al.*, 2007) which may explain the preceding results.

Lipid profile:

Cholesterol in plasma of summer- calving buffaloes was little but not significantly higher (86.30 mg/dl) than in winter-calving buffaloes (82.31 mg/dl). Cholesterol levels did not differ between growing and mature buffaloes (Table, 4) Triglycerides (TG) followed the same trends as cholesterol. Mc Namara *et al.*, (1995) and Tekelioglu *et al.*, (2010) suggested that milk fat levels are influenced by plasma lipid concentrations. Likewise Hammon *et al.*, (2009) reported that high intensive fat metabolism occurs to provide milk fat. Meanwhile, TG increase with increased fat metabolism.

CONCLUSION:

Calving season exerted a significant effect on milk production and components where summer-calving buffaloes produced higher milk and milk components than winter-calving buffaloes. Mature lactating buffaloes produced more milk and milk components within calving season. Plasma ALT, AST and ALP levels followed milk production in all groups.

REFERENCES:

Abd El-Ghany W.H., A. A. El-Sherbiny, M. H. Khalil, and W. A. Ramadan (2010) Role of the Wool Coat Density on Some Adaptive Measurments of Barki Sheep under Semi-Arid Conditions. *Egypt. Basic Appl. Physiol.*, 9 (2): 247-263.

Abo El-Nor S. A. H., M. H. Khattab, H. A. Al-Alamy, F. A. Salem, M. M. Abdou (2007) Effects of Some Medicinal Plants Seeds in The Rations on The Productive Performance of Lactating Buffaloes. *Int. J. dairy sci.*, 2 (4): 348-355.

Ahmad S. and M. Tariq (2010) Heat stress management in Water Buffaloes: a Review (2010) 9th world buffalo congress, Argentina; 2 Clinical and Animal Welfare, 297-310.

Allain C. C., L. S. Poon, C. S. G. Chan, W. Richmond, and P. C. Fu (1974) Enzymatic Determination of Total Serum Cholesterol. *Clin. Chem.* 20 (4): 470-475.

Amundson J. L., T. L. Mader, R. J. Rasby, and Q. S. Hu (2006) Environmental Effects on Pregnancy Rate in Beef Cattle. *J. Anim. Sci.*, 84, 3415-3420.

AOAC (1990) Official Methods of Analysis. 15th ed. Association of Official Analytical Chemists. Washington, DC.

Belfield A. and D. M. Goldberg (1971) Revised Assay for Serum Phenyl Phosphatase Activity Using 4-Aminoantipyrine. *Enzyme*, 12, 561-573.

Boots L.R., T.M. Ludwick, and E.R. Rader (1970) Plasma Glutamic-Oxaloacetic and Glutamic-Pyruvic Transaminase Activities in Lactating Holstein Cattle. 2. Some Effect of Environmental Temperature, Season, Body Weight and Age. *J. Dairy Sci.*, 50, 998.

Chaiyabuter N., Buranakarl, C., Muangcharoen, V., Loypetjra, P., Pichaicharnarong, A., (1987) Effects of Acute Heat Stress on Changes in The Rate Of Liquid Flow from The Rumen and

Turnover of Body Water of Swamp Buffalo (Bubalus Bubalis). *J. Agric.Sci.*, (Camb.) 49–553 1 08.

Doumas B.T., W.A. Watson, H.G. Biggs (1971) Albumin Standards and the Measurement of Serum Albumin with Bromocresol Green. *Clin Chim Acta* , 31: 87–96.

Fassati, P. and L. Prencipe (1982) Serum Triglycerides Determined Colorimetrically with An Enzyme That Produces Hydrogen Peroxide *Clin. Chem.*, 28: 2077-2080.

Ghoneim A. (1967) Animal Nutrition (feeding requirements and economic rations), Anglo Press lib. (In Arabic), Cairo, Egypt.

Gornal A.C; C.J. Bardawill and M.M. David (1949) Determination of Serum Proteins by Means of The Biuret Reaction , *J. Biol. Chem.* 177 : 751-767.

Gudev D., S. Popova-Ralcheva, P. Moneva, Y. Aleksiev, T. Peeva, Y. Ilieva, and P. Penchev (2007) Effect of Heat-Stress on Some Physiological and Biochemical Parameters in Buffaloes. *Ital. J. Anim. Sci.*, 6 (2): 1325-1328.

Hammon H. M., G. Stürmer, F. Schneider, A. Tuchscherer, H. Blum, T. Engelhard, A. Genzel, R. Staufenbiel, and W. Kanitz, (2009) Performance and Metabolic and Endocrine Changes with Emphasis on Glucose Metabolism in High-Yielding Dairy Cows with High and Low Fat Content in Liver after Calving. *J. Dairy Sci.*, 92: 1554-1566.

Javed K., M. E. Babar, M. Shafiq and A. Ali (2009) Environmental Sources of Variation for Lactation Milk Yield in Nili Ravi Buffaloes. *Pakistan J. Zool. Suppl.*, 9: 79-83.

Johnson H.D., M.D. Shanklin , and L. Hahn (1989) Productive Adaptability Indices of Holstein Cattle to Environmental Heat. Agriculture and Forest and Meteorology Conf., 291–297.

Kaylegian, K. E., J. M. Lynch, J. R. Fleming, and D. M. Barbano (2009) Influence of Fatty Acid Chain Length and Unsaturation on Mid-infrared Milk Analysis. *J. Dairy Sci.* 92:2485–2501.

Khalil M.H. (2005). Basic Biology. 2nd edition, University Book House, Al-Ain U.A.E.

Koubková M., I. Knížková, P. Kunc, H. Härtlová, J. Flusser, O. Doležal (2002) Influence of High Environmental Temperatures and Evaporative Cooling on Some Physiological, Hematological and Biochemical Parameters in High-Yielding Dairy Cows. *Czech J. Anim. Sci.*, 47 (8): 309–318.

Marai I.F.M., and A.A.M. Habeeb (2010) Buffalo's Biological Functions as Affected By Heat Stress — A Review. *Livestock Science* 127, 89–109.

Marai I.F.M., A.A. El-Darawany, E.I. Abou-Fandoud, M.A.M. Abdel-Hafez (2006) Tunica Dartos Index as a Parameter for Measurement of Adaptability of Rams to Subtropical Conditions of Egypt. *Anim. Sci. J.* (Japan) 77 (5), 487–494.

Marai I.F.M., A.A.M. Habeeb , and A.E. Gad, (2002) Rabbit's Productive, Reproductive and Physiological Traits as Affected By Heat Stress (A Review). *Livest. Prod. Sci.* (Netherlands) 78, 71–90.

Mc Namara J. P., J. H. Harrison, R. L. Kincaid, and S. S. Waltner, (1995) Lipid Metabolism in Adipose Tissue of Cows Fed High Fat Diets During Lactation. *J. Dairy Sci.*, 78: 2782-2796.

Mourad K., E.A. Afifi, and L.H. Bedeir, (1990) Nongenetic Factors Influencing Milk Production Traits in Egyptian Buffaloes. *Egypt. J. Anim. Prod.*, 72: 1-18.

Mourad K., M.M. Mohammed, and A.S. Khatab (1991) Genetic Parameters for Milk Production Traits in a Closed Herd of Egyptian Buffaloes. *Egypt. J. Anim. Prod.*, 28: 11-20.

Mourad M. and S. Rashwan (2001) Milk Production of Buffaloes and Causes of Calf Mortality under a Semi-Intensive Production System in Egypt Revue Élev. *Méd. vét. Pays trop.*, 54 (2): 139-145.

Nessim M.G., (2004) Heat-Induced Biological Changes as Heat Tolerance Indices Related to Growth Performance in Buffaloes. *Ph.D. Thesis*, Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

Rasooli A., M. Nouri, G. H. Khadjeh, and A. Rasekh (2004) The Influence of Seasonal Variation on Thyroid Activity and Some Biochemical Parameters of Cattle. *Iranian J. vet. Res.*, 5 (2): 55-62.

Reitman A. and S. Frankel (1957) A Colorimetric Method for The Determination of Glutamic Oxaloacetic and Glutamic Pyruvic Transaminases. *Amer J. Clin. Path.*, 28: 56-63.

Shafie M.M., and A.L. Badreldin, , (1962) The Role of Blood in Regulation of Body Heat in Bovines. *J. Anim. Prod.*, Cairo, UAR 2, 61–76.

Sobiech P., S. Milewski, and S. Zduńczyk (2008) Yield and Composition of Milk and Blood Biochemical Components of Ewes Nursing a Single Lamb or Twins. *Bull Vet Inst Pulawy* 52, 591-596.

SPSS (1999). Statistical software package for the social sciences SPSS, Int., USA.

Tanaka M., Y. Kamiya, M. Kamiya, and Y. Naka (2007) Effect of High Environmental Temperatures on Ascorbic Acid, Sulfhydryl Residue and Oxidized Lipid Concentrations in Plasma of Dairy Cows. *Anim. Sci. J.*, 78, 301-306.

Tekelioglu O., M. Cimen, and T. Bayril (2010) Bovine Plasma Lipid Concentrations in Machine Milked Cows during Early Lactation Period. *J. Animal & Plant Sci.*, 5 (3): 540- 543.

Tyrrell T. F., and J.T. Reid (1965) Prediction of the Energy Value of Cow's Milk. *J. Dairy Sci.* 48, 1215–1223.

Ueno T., K. Hayasaka., and N. Takusari (1999) Effects of Extreme Hot Climate on Milk Production in Lactating Holstein Cows the Hokkaido National Agricultural Experiment Station (Hitsujigaoka). *Res. Bull. Nati. Agric.*, 168, 35-45.

Yousef H. M., (1990) Studies on Adaptation of Friesian Cattle in Egypt. *Ph.D. Thesis*, Faculty of Agriculture, Zagazig University, Zagazig, Egypt.

الأداء الإنتاجي للجاموس المائي في مصر وتأثره بالموسم

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أجريت هذه الدراسة على ٢٠ جاموسة حلابة للمقارنة بين أثر كل من موسم الولادة ومرحلة النمو على إنتاج اللبن. في الشتاء تم تقسيم ١٠ حيوانات إلى مجموعتين : (أ) (حيوانات حلابة نامية = ٧) و (ب) حيوانات حلابة ناضجة وعددها = ٣). في الصيف تم تقسيم ١٠ حيوانات إلى مجموعتين : (أ) حيوانات حلابة نامية وعددها = ٤) و(ب) حيوانات حلابة ناضجة (وعددها =٦). تم أخذ عينات اللبن إسبوعياً حتى نهاية موسم الحليب في كل الحيوانات، تم قياس درجة حرارة المستقيم وأخذ عينات الدم شهريا حتى نهاية موسم الحليب، تم تخزين بلازما الدم حتى تقديرها وقد تم إجراء التحليل على بعض القياسات وتحليل إحصائي للبيانات باستخدام برنامج SPSS لمعرفة الفروق بين تأثير موسم الولادة وتأثير مرحلة النمو التي أخذت في هذه الفترات. ويمكن تلخيص النتائج المتحصل عليها على النحو التالي: دليل الحرارة والرطوبة THI كان أعلى من ٧٠ في الصيف وأقل من ٧٠ في الشتاء. درجة حرارة المستقيم لم تتأثر معنوياً بأي من موسم الولادة أو درجات الحرارة السائدة. الإرتفاع النسبي في درجة حرارة المستقيم في الحيوانات الحلابة والدات فصل الشتاء قد يرجع إلى تعرضها لفترات أكثر من الحرارة أثناء فترة إنتاج اللبن التي يكون معظمها أثناء فصل الصيف. الحيوانات والدات فصل الصيف يكون معظم فترة إنتاجها خلال موسم الشتاء حينما تكون درجة الحرارة المحيطة أقرب ما يمكن إلى المدى الحراري الملائم للجاموس لذلك تعطي لبن أكثر من تلك الوالدات في فصل الشتاء. الجاموس الناضج يعطي كمية أكبر من الجاموس النامي وقد يرجع هذا إلى أن جزأ من الطاقة الخاصة بإنتاج اللبن قد توجه إلى النمو. والدات فصل الصيف كان لها فترات إنتاج أطول من والدات فصل الشتاء. النسبة المئوية للبروتين في اللبن كان أعلى معنويا في الحيوانات والدة الصيف عن والدات الشتاء، بينما لم يكن هناك فروق ذات دلالة بين والدات فصل الشتاء ووالدات فصل الصيف في نسب اللاكتوز والدهن والجوامد الكلية. إنزيمات ALT كانت أعلى معنوياً في والدات فصل الصيف عن والدات الشتاء. إنزيمات ALT كانت أعلى معنوياً في والدات فصل الصيف الناضجة عن تلك النامية في موسمي الولادة. إنزيمات AST و ALP لم تظهر فروق معنوية بين المجموعات المختلفة. كانت مستويات البروتينات الكلية والجلوبيولين في الدم أعلى في والدات فصل الصيف عن والدات فصل الشتاء ولم يكن هناك فروق معنوية بين الحيوانات النامية والناضجة. إلا أن مستوى الألبيومين لم يظهر فروق معنوية بين موسمي الولادة. نسبة الألبيومين إلى الجلوبيولين كانت في المعدل الطبيعي ولم يكن هناك فروق ذات دلالة بين أي من المجموعات المختلفة. عموماً فإن الحيوانات والدات فصل الصيف تنتج لبن أكثر في الكم والمكونات عن والدات فصل الشتاء. كما أن الحيوانات الناضجة تعطي لبن أكثر من الحيوانات النامية. إنزيمات ALT و AST و ALP تتبعت إنتاج اللبن في كل المجموعات.