Egyptian J. Anim. Prod. Vol. 33(1)(1996):11-21.

EFFECT OF DRIED LIVE YEAST SUPPLEMENT ON HAEMOBIOCHEMICAL LEVELS AND MILK PRODUCTION RESPONSES OF LACTATING BUFFALOES, UNDER HOT SUMMER CONDITIONS IN EGYPTH

H.M. Yousef[1], K. A. El-Masry[2] and A. I. Aboulnaga[1]

1- Animal Production Research Institute, Ministry of Agriculture, Cairo, Egypt.
2- Division of Radioisotopes Applications, Nuclear Research Center, Atomic Energy Authority, Cairo, Egypt

SUMMARY

Twenty seven lactating buffaloes (Bubalus bubalis) in the fourth season of lactation and having an average daily milk yield of 5.5 to 7.2 kg were used in the present study. Nine lactating buffaloes were used (winter group) to determine the physiological and production status of lactating buffaloes in the winter season. During the summer season, 18 lactating buffaloes of the same physiological and production status as the winter group were divided into two equal groups (summer groups), whereas the first summer group was compared with the winter group to study the influences of hot summer conditions on haemobiochemical and milk production levels of lactating buffaloes, and served as control. While the second summer group was supplemented with 15g LY (Dried live yeast, Saccharomyces Cereivisiae) per animal daily for 3 months to study the effects of supplementation of DLY on the same parameters of lactating buffaloes under hot summer conditions of Egypt.The results showed that under hot summer conditions, the buffaloes had significantly lower T3, T4, total protein, albumin and haemoglobin (Hb) and higher cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL) concentrations than those found under winter season conditions. Dry matter intake (DMI), gross energy intake (GEI), daily milk yield, and milk yield, of 40 g/kg fat corrected milk (FCM) and milk compositions secreted either as g/kg milk or kg/day were significantly lower, while rectal temperature (RT) and GE intake as MJ/kg FCM were significantly higher in lactating buffaloes maintained under hot summer conditions compared to those under winter season conditions.

Supplementation of the heat stressed lactating buffaloes with 15 g DLY/ animal daily for 3 months increased significantly the terms of T3, T4, total protein, albumin and Hb concentrations, as well as DMI, GEI, daily milk yield and milk yield of 40 g / kg FCM and compositions of milk secreted as kg / day. However, significant decreases occurred in cholesterol, HDL and LDL concentrations and food conversion (GE intake, MJ per kg milk, of 40 g / kg FCM) and RT. It is concluded that supplementation of lactating buffaloes with DLY under hot summer conditions of

Egypt reduced heat stress effect as shown by a decline in RT which accompanied with an improvement in milk yield and its composition.

Keywords: Buffaloes, heat stress, yeast, blood constituents, milk yield and its composition.

INTRODUCTION

Heat stress and health factors may impose constraints when feeding buffaloes in the tropics (Leng, 1990 and Nangia and Garg, 1992) and cause decreased feed intake and milk yield (El-Masry and Marai 1991; Gajbhiye and Tripathi, 1991) and affect its composition (Verma, *et al.*, 1990) and alter haemobiochemical component levels (Kamal, 1975; Baccari *et al.*, 1988; El-Masry and Marai, 1991; Nangia and Gary, 1992; Habeeb *et al.*, 1992). However, yeast culture has been shown to have several effects in ruminants, since it alters feed performance and nutrient digestibility (Wohlt *et al.*, 1991); rumen microbial activities (Huber *et al.*, 1989), nitrogen and minerals retention (Cole *et al.*, 1992), protein synthesis in the digestive tract (Williams, 1989) and milk yield and its composition (Kumar *et al.*, 1992; Singh, 1993; Piva *et al.*, 1993) in dairy cattle under moderate ambient temperature. The objective of the present study was to determine the effects of high environmental temperature and dietary supplementation with DLY (Dried live yeast) on thyroid activity, haemobiochemical changes, feed performance, milk yield and composition of buffaloes under hot summer conditions of Egypt.

MATERIALS AND METHODS

Twenty seven lactating buffaloes (Bubalus bubalis) in the fourth season of lactation, at a mean 60 + 8 days postpartum and having an average daily milk yield of 5.5 to 7.2 kg were used in the present study. The experiment was carried out in the farm of EL-Gemeza, belonging to Animal Production Research Institute,Ministry of Agriculture, Egypt, while hormonal and haemobiochemical parameters were determined in Radiobiology Department, Nuclear Research Center, Atomic Energy Authority, Egypt. In the winter season, nine lactating buffaloes (winter group) were maintained under mid winter conditions for 3 months in December, 1993, January and February, 1994, to determine haemobiochemical levels, milk yield and composition. In the summer season, two groups of lactating buffaloes (summer groups), each of nine animals were maintained under mid summer conditions for 3 months in June, July and August, 1994. The first summer group was compared with the winter group to study the effects of the hot summer season conditions of Egypt on the above mentioned parameters and was considered as a control. Each animal in the second summer group was received 15 g DLY (Saccaromyces cerevisiae, 5 x 109 c.f.u. Sc strain 1026 per g) daily, mixed with a concentrate diet just before feeding for a period of 3 months.The animals were kept outdoors under shade day and night. The monthly variations of air temperature and relative humidity during the months of the experimental periods are presented in Table 1. In both winter and summer seasons, all the animals were provided with a pelleted concentrate diet at 7.00 h according to their milk yield and were also offered 5 kg hay and 7 kg rice straw/animal/day. The refused feed was weighed out in the next day before feeding. Each kilogram of pelleted concentrate diet contained (as fed) the following: 400g, undecorticated cotton seed meal; 200g, yellow maize; 295 g, wheat bran; 40 g, rice bran; 35 g, molasses; 20g, limestone; 9.89g, common salt; 0.04g dairy trace; mineral mixture; 0.16g, vitamin A, D and E premix. Chemical composition of foodstuff and DLY according to Association of Official Analytical Chemists (1984) and their gross energies as Mega Joules/kg dry matter calculated according to Alderman, *et al.* (1975) are presented in Table 2. Food Conversion (Gross energy intake / Total milk yield) was calculated. The animals were hand milked twice daily at 8.00 and 17.00 h, and milk yield was recorded at each milking. Four percent of a morning and subsequent evening milk yield from each animal was collected weekly for sampling. Milk samples were analysed for fat by using the Gerber tube method, protein by Kjeldahl digestion method, lactose by the method of Marier and Boulet (1959), and total solids by oven- drying. The 40 g / kg FCM yield was calculated using the equation of Gaines and Overman (1938) which is equal to (0.4 x kg milk per day)+(15 x kg milk fat per day). Feed conversion was expressed as GE intake, Mega Joules / kg milk yield or GE intake, Mega Joule / kg milk, of 40 g per kg FCM was calculated. Rectal temperature was recorded three times daily at 12.00, 13.00 and 14.00 h and the values were averaged. Heparinized blood samples were taken twice from the jugular vein of each animals, four hours after eating and watering in February, 1994 from the winter group and in August, 1994 from non-supplemented and DLY supplemented summer groups. Hematacrit% (Ht%) was estimated with the use of a Wintrobe tube. Blood Hb level was determined and plasma samples were assayed for total proteins, albumin, cholesterol, HDL, LDL, Ca, inorganic Phosphorus and triglycerides concentrations according to Tietz (1982). Globulin was calculated by subtracting albumin from total proteins. Thyroid hormones were determined by using T_3 and T_4 hormones labeled with radioactive 125-I in the kits of radioimmuno-assay technique, manufactured by PANTGX, Santa Monica, California.

The differences between means of winter and non-supplemented summer groups and between non-supplemented and DLY-supplemented groups, in summer, were tested by using an unpaired "t" test according to Snedecor and Cochran (1982).

Table 1. Monthly variations in air temperature and relative humidity in the area of El-Gemeza Research Station, during the periods of the study (1993 and 1994)

	Air Temperature (°C)			Relative Humidity (%)		
Months	Max.	Min.	Mean	Max.	Min.	Mean
December 1993	23.4	9.5	16.4	75.5	60.2	67.8
January 1994	21.7	8.9	15.3	77.2	62.4	69.8
February 1994	19.8	9.3	14.6	78.5	60.3	69.4
June 1994	34.8	22.5	28.7	68.5	46.1	57.3
July 1994	37.2	21.9	29.6	62.8	55.1	58.9
August 1994	39.2	24.5	31.9	66.4	59.0	62.7

Table 2. Chemical composition (g/Kg DM) and gross energy (MJ/Kg DM) of the experimental foodstuffs and dried live yeast

Item	Concentrate	Colver Hay	Rice Straw	Dried Live Yeast
Chemical Compositon:				
Moisture	117.7	111.8	78.0	61.2
Crude protein	171.4	134.1	29.2	530.2
Crude fiber	115.2	257.3	320.1	48.1
Nitrogen-free extract	539.4	345.2	371.2	317.0
Ether extract	43.1	23.1	11.2	7.2
Ash	13.2	128.5	190.3	36.3
Gross energy* (MJ/Kg DM)	17.38	15.0	13.81	18.79

* Gross energy was calculated according to Alderman *et al.* (1975).

RESULTS AND DISCUSSION

As shown in Table 3, hot summer season conditions resulted in an increase ($P<0.05$) in RT compared to winter season conditions. Supplementation of DLY (Dried live yeast) to the basal diet of buffaloes, caused a significant ($P<0.05$) decline in their RT relative to non-supplemented buffaloes, under hot summer conditions. The latter results are in agreement with those observed in lactating cows by Huber *et al.* (1989); Higginbotham *et al.* (1994) who reported that supplementation of yeast to hyperthermic animals reduced body temperature.

Plasma T_3 and T_4 concentrations in lactating buffaloes were significantly ($P<0.01$) lower in summer than in winter season conditions. Similar trends in plasma T_3 (Baccar *et al.*, 1988) and T_4 levels (El-Masry and Habeeb, 1989) have been found in heat stressed buffaloes. When the lactating buffaloes were supplemented with DLY during the summer season, T_3 and T_4 concentrations increased significantly ($P<0.05$) compared to non-supplemented animals maintained under the same environmental conditions. Glade (1991) suggested that supplementing lactating mares with DLY causes an increase in T_3 and T_4 levels.

The lactating buffaloes in the hot summer season had significantly lower total proteins, albumin and Hb concentrations, as well as Ht% and higher total cholesterol, HDL and LDL concentrations than those in the winter season. Supplementation of DLY to lactating buffaloes significantly raised total proteins, albumin, and Hb concentrations, however a significant depression in cholesterol,HDL and LDL concentrations was evident compared to non-supplemented animals. Considering the haemobiochemical changes, it can be seen that variations in plasma protein

Table 3. Effects of hot summer season conditions and dietary supplementation with dried live yeast on rectal temperature and haemobiochemical level changes (X+S.E.) of lactating buffaloes in Egypt.

Items	Winter season		Summer season				Percentage differences between W. and S.season groups	Percentage differences between non-suppl. & suppl. groups in summer season
	Control Diet		Control Diet		Dried Live Yeast			
	Mean	SE	Mean	SE	Mean	SE		
Rectal temperature (°C)	38.35	0.04	39.78$^{b}_{a}$	0.05	38.84$^{d}_{d}$	0.05	3.72	-2.36
T3 (ng/ml)	1.78	0.15	1.23^{a}	0.09	1.57^{d}	0.17	-30.89	27.64
T4 (ng/ml)	86.15	2.31	63.25$^{a}_{a}$	3.11	77.28^{d}	2.49	-26.58	22.18
Total protein (g/l)	83.10	2.40	68.70$_{a}$	2.80	77.60^{d}	3.30	-17.32	12.95
Albumin (g/l)	58.70	3.70	45.80^{a}	1.70	53.50^{d}	2.40	-21.97	16.81
Globulin (g/l)	24.40	1.20	22.90$_{b}$	1.20	24.10^{d}	1.20	-6.14	5.24
Hb (g/l)	12.31	0.90	10.82$^{b}_{b}$	0.7	11.60	0.61	-12.1	7.2
Ht (%)	30.32	2.09	28.40^{b} ^{a}	1.72	28.90^{c}	1.92	6.33	1.67
Total Cholesterol (mg/l)	1528.80	48.20	1856.4$^{a}_{a}$	94.40	1463.51$^{c}_{c}$	68.20	21.42	-21.16
HDL (mg/l)	366.90	16.70	501.10$^{a}_{b}$	23.70	390.10^{d}	33.71	36.57	-22.15
LDL (mg/l)	886.70	37.20	949.51^{b}	57.30	811.50	51.50	7.08	-14.53
Triglycerides (mg/l)	1070.10	152.81	887.52^{b}	117.50	997.40	108.20	-17.06	12.38
Plasma Ca (mg/l)	108.70	6.41	94.50	5.40	99.80	6.20	-13.06	0.74
Plasma P (mg/l)	57.40	3.11	55.60	3.81	55.70	3.40	-3.13	0.17

Differences between means of winter and summer (non-suplemented) groups, significant (a', $P<0.01$ and b, $P<0.05$) and between means of non-supplemented and DLY-supplemented groups in summer, significant (c, $P < 0.01$ and d, $P < 0.05$).

1- Winter season (W), (14.4 °C and 71.6% RH), 2- Summer season (S), (37.6°C and 33.8% R.H.), 3- Supplemented ration (Suppl.), 4- Non-Supplemented ration (non-suppl.).

concentration are thought to be related to the increase or decrease in T_4 level and in albumin or globulin concentrations, as found by El-Masry and Marai (1991). Also, Glade (1991) found that the changes in blood protien concentrations may be mediated through alterations in thyroid hormones metabolism when the mares were supplemented with DLY. Similar decline in Ht% has been observed in lactating buffaloes maintained under hot summer conditions in Egypt (El-Masry and Marai, 1991). The significant change in Hb concentration (Table 3) is greatly dependent upon Ht% since the change in trends of Ht%, provide an important clue to the likely cause of the Hb concentration (Fairbanks, 1982).

The levels of HDL and LDL significantly followed the same trend of cholesterol, then the variations in lipoprotein fractions were readily reflected on the cholesterol concentration as found by Ellefeson and Caraway (1982). Moreover, the significant depression in cholesterol level by DLY supplementation may be due to the reason that yeast has anticholesterolaemic effects (Fuller, 1989). Triglycerides concentration tended to decline but insignificantly due to heat stress in summer, however the case was ameliorated by supplementation with DLY; Glade (1991) found in mares that DLY maintain a greater steady state plasma concentration of triglycerides. Plasma Ca significantly ($P< 0.05$) declined with heat stress, which may be due to a significant decline in DMI, while an insignificant increase in the DLY supplemented group was detected. Plasma inorganic P levels showed insignificant change either to heat stress or DLY supplementation.

Dry matter intake and GEI decreased significantly in buffaloes in the summer season compared to those in the winter season. Similar trend was observed by El-Masry and Marai (1991) in lactating buffaloes under hot conditions in Egypt. Also, Nangia and Garg (1992) found under artificial conditions that feed intake of buffaloes during the hot period (42°C) was 40% less than during the cold period (20°C). Daily milk yield and milk yield of 40 g / kg FCM and fat, protein, lactose and total solids concentrations of milk as g/kg milk or kg/ day were significantly lower during hot summer than those obtained during winter. The significant decline in both DMI and GEI is reflected in lower milk yield and composition, concomitantly a combination with suppressive effect of heat stress on thyroid activity and most blood metabolite levels (El-Masry and Habeeb, 1989, El-Masry and Marai, 1991) (Table 3). As shown in Table (4) GE intake, MJ/ kg milk of 40 g/ kg FCM increased significantly ($P< 0.05$) in buffaloes in the summer season compared to those under winter season conditions. This means that heat stressed buffaloes in summer required more gross energy to produce 1 kg milk of 40 g / kg FCM than those recorded in winter season (22.92 vs. 27.09).

During summer season conditions, DMI and GEI tended to be greater ($P < 0.05$) for buffaloes received-DLY compared with those that received the control diet. Similar increase in DMI was recorded by Cole, *et al.* (1992) in calves and lambs due to yeast supplementation. Addition of DLY to the basal diet of heat stressed buffaloes increased ($P< 0.01$) daily milk yield and milk yield of 40 g/ kg FCM over the control group and the peak milk yield occurred from the second week onwards and the buffaloes fed yeast averaged an additional 882.9 kg of milk and 1692.9 kg milk yield of 40 g / kg FCM, during the 90 days study. Milk fat concentration either as g / kg milk or kg/ day and production of protien, lactose and total solids increased significantly only in DLY supplemented groups compared to non-supplemented one. The improvement in milk yield by DLY supplementation supports data of an earlier

Table 4. Effects of hot summer season conditions and dietary supplementation with dried live yeast in milk yield and its compostion (X±S.E.) of lactating buffaloes in Egypt

Items	Winter season		Summer season				Percentage differences between W. and S. Season groups	Percentage differences between non-suppl. and suppl. groups in summer
	Control Diet		Control Diet		Dried Live Yeast			
	Mean	SE	Mean	SE	Mean	SE		
Feed Performance:								
Dry matter intake (kg/day)	15.29	0.45	12.07^{a}	0.33	13.81^{d}	0.38	-21.05	14.41
Gross energy intake (MJ/day)	258.57	7.21	210.23^{a}	6.45	232.42^{d}	6.88	-18.69	10.55
Milk yield (kg/day)	7.22	0.18	5.54^{a}	0.15	6.63^{c}	0.15	-23.26	19.67
Fat corrected milk yield, 40g /kg FCM	11.28	0.23	7.76^{a}	0.18	9.85^{c}	0.24	-31.2	26.93
Feed Conversion (intake / yield):								
GEI, MJ/kg milk yield	35.81	1.15	37.94^{b}	1.32	35.05^{d}	1.09	5.94	7.61
GEI, MJ/kg milk, 40g/kg FCM	22.92	0.9	27.09^{b}	0.96	23.59^{d}	0.88	18.19	-12.19
Milk Composition:								
Fat (g / kg milk)	78.20	0.28	67.50^{b}	0.35	73.50^{d}	0.38	-13.68	8.88
Protein (g / kg milk)	46.20	0.50	41.50^{b}	0.42	43.60	0.42	-10.17	5.06
Lactose (g / kg milk)	54.82	0.30	45.60^{a}	0.20	46.83	0.30	-16.81	2.69
Total solids (g / kg milk)	192.20	0.68	165.80^{b}	0.77	178.30^{c}	0.61	-13.73	7.53
Fat yield (kg / day)	0.56	0.01	0.37^{a}	0.02	0.48^{c}	0.01	-33.92	29.72
Protein yield (kg / day)	0.33	0.02	0.23^{a}	0.01	0.29^{c}	0.02	-30.3	26.08
Lactose yield (kg / day)	0.39	0.01	0.25^{a}	0.01	0.31^{c}	0.01	-35.89	24.00
Total solids yield (kg / day)	1.38	0.04	0.92^{a}	0.05	1.08^{c}	0.03	-33.33	28.26

Differences between means of winter and summer (non-suplemented) groups, significant (a', $P < 0.01$ and b, $P<0.05$) and between means of non-supplemented and DLY-supplemented groups, in summer, significant (c, $P<0.01$ and d, $P < 0.05$).
1- Winter season (W), (14.4 °C and 71.6% RH), 2- Summer season (S), (37.6°C and 33.8% R.H.), 3- Supplemented ration (Suppl.), 4- Non-Supplemented ration (non-suppl.).

study by Singh (1993) who found that milk yield and FCM yield in buffaloes supplemented with yeast culture was increased by 13.5 and 13.8%, respectively over the control and that increases were also found in milk fat, milk protein and total solids. In the present study, the increase in DMI, GEI (Table 4) and the increase of thyroid activity and most blood metabolite levels (Table 3) are considered as important factors contributing to the higher milk yield and composition in buffaloes fed supplemental DLY. Attemps are made to explain the mode of action of the yeast in ruminants by identifying properties of yeast cell biochemistry that may integrate with rumen metabolism and result in an increased in the number of bacteria, especially cellulytic bacteria, microbial fermentation rates, the protein turnover of the microbes, the hydrogen ion exchange and the metabolism of carbohydrates (Huber *et al.*, 1989 and Williams, 1989). The addition of yeast to the diets of ruminants increased the quantities of volatile fatty acids formed to provide metabolizable energy and to stimulate protein synthesis in the rumen in order to improve the supply of amino acids and other nutrients to the mammary gland (Huber *et al.*, 1989) which leads to an increase in milk yield and composition. It can be noted that GE intake, MJ/ kg milk, of 40g/kg FCM was significantly ($P<0.05$) lower in buffaloes supplemented with DLY, compared to non-supplemented ones in summer and means that the buffalo supplemented with DLY required less GE intake to produce 1 kg milk, or 40g / kg FCM than the non-supplemented buffalo (23.59vs. 27.09).

In conclusion, DLY supplementation has a potential for reducing heat stress effect and improving milk production of buffaloes under hot summer conditions in Egypt.

REFERENCES

Alderman, G., A. Harvard, J.R. Todd, R.A. Edward and A.E. Morgan, 1975. Energy allowance and feeding systems for ruminants. London; HMSO (Ministry of Agriculture, Fischeries and Food Technical Bulletin, No. 33.

Association of Offiial Analytical Chemists, 1984. Official methods of analysis. AOAC; Arlington. VA., U.S.A.

Baccari, F., JR. Blasi, L.M.R. Muniz, and C.A. Fre, 1988. Effect of thermal stress on feed intake and serum triiodothyronine in young buffalo bulls. In Proccedings of II World Buffalo Congress, held in India during 12-16 December 1988, 3: 139-143.

Cole, N. A., C.W. Purdy, and D.P. Hutcheson, 1992. Influence of yeast culture on feeder calves and lambs. Journal of Animal Science, 70: 1682-1690.

Ellefeson R. D. and W.T. Caraway, 1982. Lipids and Lipoproteins. In Fundamentals of clinical chemistry (ed. N. W. Tietz), p. 474. W. B. Saunders Company, Philadelphia.

El-Masry, K. A. and A.A.M. Habeeb, 1989. Thyroid function in lactating Friesian cows and water buffaloes under winter and summer conditions of Egypt. In: 3*rd* Egyptian-British Conference on Animal, Fish and Poultry Production, 3: 613-620, Alexandria 7-10 October, 1989.

El-Masry, K. A. and I.F.M.Marai, 1991. Comparison between Friesian and water buffaloes in growth rate, milk production and some blood constituents, during winter and summer conditios of Egypt Animal Production. 53: 39-43.

Fairbanks, V. F., 1982. Hemoglobin, hemoglobin derivatives, and myoglobin. pp. 401-418. In: Fundamentals of Clinical Chemistry (ed. N. W. Tietz), W. B. Saunders Company, Philadelphia.

Fuller, R., 1989. Probiotics in man and animals. A review Journal of Applied Bacteriology. 66: 365-378.

Gaines, W. L. and O. R. Overman, 1938. Inter-relation of milk fat, milk protein and milk energy yield. Journal of Dairy Science, 21: 261-271.

Gajbhiey, P.U. and V.N. Tripathi, 1991. Factors affecting peak yield and days to attain peak yield in Murrah buffaloes. Asian Journal of Dairy Research, 10: 166-168.

Glade, M. J. 1991. Dietary yeast culture supplementation of mares during late gestation and early lactation: effects on mare and foal plasma metabolite, amino acid and endocrine profiles. Journal of Equine Veterinary Science. 11: 167-171.

Habeeb, A. A., I.F.M. Marai, and T.H. Kamal, 1992. Heat stress. In: Farm Animals and the Environment. Edited by C. Phillips and D. Piggns, 1992. pp. 27-47. C. A. B. International, Willingford. UK at the University Press, Cambridge.

Higginbotham, G. E., C.A.Collar, M.S. Aseltine and D.L. Bath, 1994. Effect of yeast culture and Aspergillus oryzae extract on milk yield in a commercial dairy herd. Journal of Dairy Science. 77: 343-348.

Huber, J. T., J. Sullivan and B. Taylor, 1989. Effect of feeding Yea-Sace on milk production and related responses in a commercial dairy herd in Arizona pp. 35-38. In: Biotechnology in the feed industry. Proceedings of Attech's fifth Annual Symposium Attech Technical Publications. Nicholasville, KY 40356.

Kamal, T.H., 1975. Indices for heat adaptability of domestic animals. In: Progress in Animal Biometeorology. "The effect of weather and climate on animal", Johnson, H. D. Ed. Swets and Zeitlinger, Amsterdam, 1 pp. 465.

Kumer, U., V.K. Sareen and S. Singh, 1992. A note on the effect of supplementation of yeast culture (Saccharomyces cerevisiae plus growth medium) in the diet of buffaloes on milk yield and composition. Animal Production. 55: 440-442.

Leng, R. A. 1990. Ruminant nutrition in the tropics. In Developing World: agriculture (edited by Speedy, A. A.). London, UK; Grosvenor Press International Limited.

Marier, J.R. and M. Boulet, 1959. Direct analysis of lactose in milk and serum. Journal of Dairy Science, 42: 1390-1391.

Nangia, O.P. and S.L. Garg, 1992. Environmental changes in energy-yielding, blood metabolites and their relation to voluntary feed intake in buffaloes. Journal of the American Veterinary Medical Association. 45: 330-333.

Piva, G., S. Belladonna, G. Fusconi and F. Sicbaldi, 1993. Effects of yeast on dairy cows performance, ruminal fermentation, blood components, and milk manufacturing properties. Journal of Dairy Science, 76: 2717-2722.

Singh, S., 1993. Buffalo nutrition. International Milling, Flour and Feed. 187: 16-19.

Snedecor, C. W. and Cochran, W. C. ,1982. Statistical Methods. *7th* Ed.. Iowa University Press, Ames, Ia.

Tietz, N. W., 1982. Fundamentals of clinical chemistry (ed. N. W. Tietz), pp. 413-453. W. B. Saunders Company, Philadelphia, USA.

Verma, D. N., K.O. Husain and Ram Bharat, 1990. Effect of water application to the body surface of buffaloes on body temeprature, pulse, respiration and milk during summer season. Indian Veterinary Medical Journal 14: 119-124.

Willams, P. W. V., 1989. The mode of action of yeast culture in ruminant diets: A review of the effect on rumen fermentation patterns pp. 65-84. In : Biotechnology in the feed industry proceeding of Attech s, Fifth Annual Symposium-Attech Technical Publications. Nicholasville, KY 40356.

Woht, J. E., Finkelstein, A. D. and Chung, C. H. 1991. Yeast culture to improve intake, nutrient digestbility and performance by dairy cattle during early lactation. Journal of Dairy Science 74: 1395-1400.

تأثير إضافة الخميرة الجافة فى الغذاء على مستويات وإستجابة المواد البيوكيمائية فى الدم وإنتاج اللبن فى الجاموس المعرض لظروف الصيف الحار فى مصر

هيكل محمد يوسف[١]، كامل أحمد المصرى[٢]، أحمد إبراهيم أبو النجا[٢]

١- معهد بحوث الإنتاج الحيوانى - وزارة الزراعة، ٢- شعبة تطبيقات النظائر المشعة - مركز البحوث النووية - هيئة الطاقة الذرية

أستخدم فى هذه الدراسة ٢٧ جاموسة حلابه فى موسم الحليب الرابع بمتوسط إنتاج يتراوح من ٧,٢ - ٥,٥ كيلو جرام لبن يومياً.

فى فصل الشتاء: إستخدمت ٩ حيوانات لتقدير الحالة الفسيولوجية والإنتاجية لها وذلك تحت الظروف المناخية الشتوية.

فى فصل الصيف: أستخدم ١٨ حيواناً (لها نفس الظروف الفسيولوجية والإنتاجية لمجموعة الشتاء). وقسمت إلى مجموعتين متساويتين. المجموعة الأولى تم مقارنتها مع بيانات مجموعة الشتاء وفى نفس الوقت أعتبرت هذه المجموعة مجموعة ضابطة - المجموعة الثانية (المعاملة) تم إضافة ١٥ جرام حبيبات خميرة جافة لكل حيوان يومياً إلى العلف المركز لمدة ٣ شهور وذلك:

١- لدراسة التغيرات البيوكيميائية فى الدم ونشاط الغدة الدرقية وإنتاج وتركيب اللبن فى الجاموس المعرض للظروف البيئية الحارة.

٢- لدراسة تأثير إضافة الخميرة فى الغذاء على القياسات محل الدراسة فى الجاموس المعرض للظروف البيئية الحارة.

وأظهرت النتائج أن الظروف البيئية الحارة أدت إلى إنخفاض تركيز كل من هرمونات الغدة الدرقية والبروتين الكلى والألبيومين فى الدم والهيموجلوبين - وأدت إلى إرتفاع درجة حرارة الجسم وزيادة تركيز الكلستيرول والليبوبروتين العالى والمنخفض الكثافة فى الدم وزيادة فى إستهلاك الطاقة اللازمة لإنتاج واحد كيلو جرام لبن معدل.

- إضافة الخميرة إلى العلف المركز للحيوانات المعرضة للظروف البيئية الحارة أدت إلى حدوث زيادة معنوية فى نشاط الغدة الدرقية وزيادة تركيز بروتينات الدم والهيموجلوبين مع حدوث إنخفاض فى درجة حرارة الجسم وإستخدام كمية أقل من الطاقة لإنتاج واحد كيلو جرام لبن معدل.

وأستنتج من البحث أن إضافة الخميرة الجافة إلى غذاء الجاموس المعرض للظروف البيئية الحارة أدت إلى تخفيض العبىء الحرارى وتحسين الحالة الفسيولوجية والإنتاجية لهذه الحيوانات.