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AGE AND DAYS OPEN CORRECTION FACTORS AND REPEATABILITY ESTIMATES FOR YIELD AND INTERVAL TRAITS IN EGYPTIAN BUFFALOES

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SUMMARY

Data of 2673 records of 653 Egyptian buffaloes (calving from 1970 to 1985) obtained from three farms belonging to the Ministry of Agriculture was used in this study. Means of total (TMY), 305-day (305 MY) and annualized (AMY) milk yield were 1687, 1576 and 1011 Kg, respectively. Means of days in milk (DIM), days dry (DD) and calving interval (CI) were 301, 226 and 524 days, respectively.

Least squares analysis of variance showed that the effects of cow within farm, year and month of calving, age at calving (the quadratic term) and days open on most of different traits studied were significant ($P<0.05$ or $P<0.01$), while the farm and age at calving (the linear term) were not significant ($P>0.05$). Results showed curvilinear relationships of yield and interval traits on age at calving and on days open. Age and days open correction factors were calculated and tabulated.

The estimates of repeatability for TMY, 305 MY, AMY, DIM, DD and CI were 0.35, 0.33, 0.30, 0.30, 0.30 and 0.08, respectively.

Keywords: Buffalo, correction factors, repeatability, production (yield traits), management (interval traits)

INTRODUCTION

Productive performance and reproductive efficiency are important components of profitability in dairy cattle.

For sire evaluation and selection of buffalo cows for such traits, adjusting lactation records for non-genetic factors such as month and year of calving, age and days open effects are necessary.

Schaeffer and Henderson (1972) reported that the effect of days open (DO) on milk yield is largely environmental. Abdel-Aziz and Hamed (1979b) showed that the adjustment of milk records for age at calving (AGC) is necessary to compare the genetic merits of buffalo cows in different ages. Also, Ashmawy (1991) indicated that adjusting lactation for AGC and DO effects seem necessary for sire evaluation. The ultimate aim of an evaluation of animals is to enable dairy breeders to rank their cows depending on their breeding values or on their producing abilities (PA). Repeatability estimate is an important component in estimating (PA). From the economic stand point, the annualized milk yield is considered as a good measure of yield.

The main objectives of this study were 1- establishment of age and days open correction factors in Egyptian buffaloes and 2- estimation of repeatability for some productive and reproductive traits.

MATERIALS AND METHODS

Records of Egyptian buffaloes were obtained from three farms belonging to the Ministry of Agriculture at Mehallet Mousa area, Kafer El-Sheikh governorate. The total number useable of records were 2673 produced by 653 buffaloes during the period from 1970 to 1985. Records with lactation periods shorter than 150 days and/ or abnormal ones affected by diseases or by disorders were excluded. Annualized milk yield (AMY) was computed as 365 times the ratio of total milk yield over calving interval in days.

Data were analyzed using Harvey's (1987) mixed model computer program. The following mixed model was used:

$$Y_{ijknm} = \mu + F_i + C_{ij} + A_k + M_n + b_{L1}\,(X_{1ijknm} - \bar{X}_1) + b_{Q1}\,(X_{1ijknm} - \bar{X}_1)^2 + b_{L2}\,(X_{2ijknm} - \bar{X}_2) + b_{Q2}\,(X_{2ijknm} - \bar{X}_2)^2 + e_{ijknm}$$

where: Y_{ijknm} was the ijknm th observation for days in

milk (DIM), days dry (DD), calving interval (CI), 305-day milk yield (305 MY), total milk yield (TMY), or annual milk yield (AMY); F_i was the effect of the ith farm; A_k was the effect of the kth year of calving, M_n was the effect of the nth month of calving. All the previous factors were considered as fixed effects; and C_{ij} was the random effect of the jth cow within the ith farm; b_{L1} was partial linear regression coefficient of dependent variable (Y) on age at calving (X_1) and b_{Q1} was partial quadratic regression coefficient of Y on X_1; b_{L2} was the partial linear regression coefficient of dependent variable Y on days open (X_2) and b_{Q2} was the partial quadratic regression coefficient of Y on X_2; X_1 and X_2 were the average of age at calving and days open, respectively.

Age at maximum milk yield was obtained by equating the first derivative of the regression equation with zero, and solving for x. Then, maximum production (Y_m) was calculated by substituting the value of X_m back into the predicated regression equation. Multiplicative age correction factors were computed by dividing maximum milk yield (Y_m) over the yield at a given age (Y_i).

The multiplicative DO correction factors for 305 MY and AMY were computed on the basis of 120-129 class of DO (arbitrary) as: $C_i = \mu_m / \mu_i$, where C_i = the DO correction factor, μ_m= the least-square mean of a given milk yield at the basis class and μ_i= the predicted average of milk yield at each class of DO.

Components of variance (σ^2_c and σ^2_e) were estimated from interaclass correlations using the previous model for different traits. Cows that had less than two records were excluded. Repeatability estimate equaled the ratio ($\sigma^2_c / (\sigma^2_c + \sigma^2_e)$). Standard error of repeatability was computed according to the approximate formula given by Swiger et al. (1964).

RESULTS AND DISCUSSION

Actual means, standard deviations (SD) and coefficients of variation (CV%) for different traits are given in Table 1. Means of TMY, 305 MY and AMY were 1687, 1576 and 1011 Kg, respectively. The means for DIM, DD and CI were 301, 226 and 524 days, respectively. The present estimate of TMY is lower than the estimate of 1968 Kg/ 365 d adjusted (Abdel-Aziz and Hamed, 1979a).

Alim (1978) reported that average TMY was 2025 Kg with lactation period of 311 days. While, Ashmawy (1991) found that average TMY was 1564 Kg with DIM of 322 days. When no animals were excluded because of low production of milk, Mostageer et al. (1981) obtained a low average TMY of 1227 Kg produced in 217 days. Kotby et al. (1989) found that TMY was 1292 Kg produced in 279 DIM. Sadek et al. (1993) reported that actual mean of TMY was 1394 Kg in 219 DIM. Ashmawy and Hamed (1988) found that TMY was 2035 Kg obtained in 339 DIM. However, Abdel-Aziz (1993) reported that TMY per Buffalo in Egypt ranged from 1200 to 2160 Kg in an average lactation period of 8-12 months. As expected, AMY mean was lower than TMY (Table 1) due to delayed breeding. Ashmawy (1991) found that average AMY was 1137 Kg, while Ashmawy and Hamed (1988) reported that AMY was 1289 Kg in another herd of Egyptian buffaloes.

Table 1. Means [+], standard deviations(SD), coefficients of variations (CV) and repeatability estimates (t) for different traits in Egyptian buffaloes

Trait	Mean	SD	CV%	t%[++]
Yield traits,Kg:				
Total milk (TMY)	1687	633	27	35
305-day milk (305 MY)	1576	503	23	33
Annual milk (AMY)	1011	447	32	30
Interval traits,day:				
Days in milk (DIM)	301	86	18	30
Days dry (DD)	226	108	24	30
Calving interval (CI)	524	123	6	8

+ Number of records used = 2673
++ Standard errors for estimates less than 2%.

Mean of DD of 226 days was longer than that for cattle (Schaeffer and Henderson, 1972). Kotby et al. (1989) found that DD was 333, while , Ashmawy and Hamed (1988) reported that DD was 176 days for buffaloes.

Mean of CI was 524 days. Abdel-Aziz (1993) reported that CI ranges from 442 day to 650 days of Egyptian buffalo. Delaying CI may be due to the breeder's decision, selection policy, some problems of reproductive traits, failure of heat detection in buffalo and shorter heat period and the number of bulls may not be adequate to service the buffalo cows.

The CV's (Table 1) were ranged between 23-32% for yield traits and between 6-24% for interval traits. The CV of CI was the lowest.

Non-genetic effects

Least squares analysis of variance of yield traits and interval traits are presented in Table 2. Results showed that the effects of cow within farm, year of calving, month of calving, age at calving (as quadratic term) and days open on most of different traits studied were significant ($P<0.05$ or $P<0.01$), while, the effects of farm and age at calving (linear term) were not significant ($P>0.05$). Ashmawy (1991) found that the effects of season of calving, year of calving and age at calving (expressed as parity) on each TMY and AMY were significant ($P<0.05$ or $P<0.01$). Abdel-Aziz and Hamed (1979a) reported that the effects of region, season and year of calving and interaction between region and season on TMY were significant. Ashmawy and Hamed (1988) reported that year of calving had a significant effect on TMY and AMY, while DIM and DD did not. They found that season of calving had insignificant effect on TMY, AMY, DIM and DD. Kotby et al. (1989) found that TMY and DIM were affected significantly by season and year of calving. Therefore, these non-genetic factors will be considered in any statistical analysis to remove their effects.

Least-squares analysis of variance (Table 2) indicated that age at calving (AGC) and days open (DO) are considered the major factors influencing ($P<0.01$ or $P<0.05$) most of the studied traits. Therefore, it is necessary to adjust the lactation records for AGC and DO for sire evaluation and selection of buffalo cows. Abdel-Aziz and Hamed (1979b) reported that the adjustment of milk records for AGC is necessary to compare the genetic merits of buffalo cows in different ages. Also, Ashmawy (1991) indicated that adjusting lactations for AGC and DO effects seem necessary for sire evaluation.

Table 2. F-ratios of least-squares analysis of variance for different traits

Source of variance	d.f.	F-ratio					
		Yield trait+			Interval trait+		
		TMY	305 MY	AMY	DIM	DD	CI
Farm	2	0.31	0.59	0.32	1.22	1.24	0.19
Cow/farm	650	3.10**	2.95**	2.72**	2.70**	2.75**	1.36**
Year of calving	15	3.51**	3.97**	3.63**	10.53**	10.59**	1.20
Month of calving	11	3.38**	2.80**	1.85*	4.44**	4.38**	1.09
Age at calv. linear	1	3.65	1.74	0.31	1.74	1.82	0.12
Age at calv. quadratic	1	17.85**	9.58**	3.47	3.80	3.97*	1.50
Days open linear	1	214.97**	92.24**	120.51**	571.72**	985.24**	13746.58**
Days open quadratic	1	27.94**	22.48**	1.20	56.04**	57.84**	1040.01**
Remainder df	1990						
Remainder mean squares		204769	135308	107027	3066	3047	874

+ See Table (1).
* = P<0.05, **= P<0.01, otherwise f-ratio are not significant at P>0.05.

Regression coefficients

Polynomial regression analysis of the second degree yielded, in most cases, significant (P<0.05 or P<0.01) partial linear and quadratic regression coefficients of traits on AGC and DO. The estimates of regression coefficients are given in Table 3. The partial regression coefficients showed curvilinear relationships (P<0.05 or P<0.01) of yield or interval traits on age at calving. Most yield traits increased in a curvilinear shape with the increase of AGC. Also, DIM showed the same trend, while DD or CI showed a trend opposite to that showen by DIM.

Significant partial linear and quadratic regression coefficients showed that 305 MY & TMY and interval traits increased in a curvilinear fashon (P<0.01) with the increase of DO. The partial regression coefficient of AMY on DO was significant (P>0.01) while the quadratic term was not. Increase of DO lead to an increase in DIM and CI in a curvilinear relationship, while DD showed a trend different to that shown by DIM or CI. Ashmawy (1991) found that TMY increased with increasing DO, While AMY decreased in Egyptian buffalo. Ashmawy and Hamed (1988) reported that DO (Linear and

quadratic) had a highly significant effects on TMY, DM and DD. The partial linear regression coefficient of AMY was highly significant, while the quadratic term was not significant. The curvilinear relationship of TMY, 305 MY or AMY on AGC or DO is similar in trend to those results reported for dairy animals (e.g. Schaeffer and Henderson, 1972; Ashmawy and Hamed, 1988; Khattab and Ashmawy, 1988; Ashmawy 1991; Khalil et al., 1992 & 1994).

Table 3. Regression coefficients (b) with standard errors (SE) for different traits on age at calving and days open

Trait+	Age at calving (mo.)				Days open			
	Linear		Quadratic		Linear		Quadratic	
	b	SE	b	SE	b	SE	b	SE
Yield trait,Kg:								
TMY	6.7002	3.4636	-0.0795**	0.0185	2.1649**	0.1459	-0.0024**	0.0004
305 MY	3.7623	2.8089	-0.0471**	0.0150	1.1528**	0.1183	-0.0017**	0.0004
AMY	1.4212	2.4956	-0.0253	0.0133	-1.1718**	0.1051	0.0004	0.0003
Interval trait,days:								
DIM	0.5659	0.4257	-0.0045	0.0023	0.4321**	0.0179	-0.0004**	0.0001
DD	-0.5769	0.4244	0.0045*	0.0023	0.5654**	0.0179	0.0004**	0.0001
CI	-0.0783	0.2291	0.0015	0.0012	1.1315**	0.0097	-0.0010**	0.0003

+ See Table (1)
* P=<0.05, ** = P<0.01 , otherwise (b's) are not significant at P>0.05

Smith and Legates (1962) attributed such curvilinear trend to the competition between milk production of the cow and the nutrition of her fetus especially at the 5th month of pregnancy. They also, added that it might be due to the negative association between the milk secretion hormones and the stage of pregnancy. However, Funk et al. (1987) reported that lactation yield increased rapidly as current DO increased up 100 days, the yield increased at a slower rate for longer period.

Results showed that 305 MY increased rapidly as current DO increased up 120-129 days, then yield increased, but, at a slower rate for longer periods (Table 6 & Fig. 2). While, from the economic stand point AMY decreased with increasing DO, therefore, reduction of DO is a desirable goal of dairymen. Buffalo cows should be mated early as possible for maximum

production. Also, DO may be reduced by good managerial practices such as success in heat dection and insemination at an optimum time during heat period using good quality of semen and skilled inseminators. El-Fouly et al. (1976) adviced that preparing the buffalo cows to have the full chance for conception during the season of full ovarian activity (October - March) could reduce DO considerably.

Age correction factors

Least-squares analysis of variance for the data showed insignificant effects ($P>0.05$) of farm on milk yield (Table 2). Therefore, the three farms were considered as one region. So, one set of multiplicative age-correction factors for adjusting milk records to mature basis was established for usage in Mehallet-Mousa area. These factors were obtained by using 305 MY and AMY records, which corrected for effects included in the model and produced by buffaloes milked twice per day.

Abdel-Aziz (1993) found that average productive life of females buffalo was reported to be five lactations where animals are disposed when they are about ten years old. The factors herein included the age from 30 to 179 months.

The regression coefficients of milk yield on AGC are given in Table 3. The partial regression coefficients of 305 MY and AMY on AGC showed curvilinear relationships ($P<0.01$) between MY and AGC.

Second degree polynomial regression equations used in establishment of the correction factors were:

$$Y = 1023.89 + 10.8273\ X - 0.0471\ X^2 \text{ .. for 305 MY}$$

$$Y = 803.0975 + 5.2162\ X - 0.0253\ X^2 \text{ .. for AMY.}$$

A set of multiplicative age correction factors for 305 MY was given in Table 4. The magnitude of factors for milk yield of young buffalo cows (Less than 47 months) were higher than older ones (more than 112 months). Also, results showed a rapid decline for ages of the younger buffalo cows relative to the gradual decline for ages of the older buffalo cows, i.e. factors did not exhibit large differences between consecutive classes of calving at older ages while they showed relatively large differences between consecutive classes at younger ages. These higher increments at younger ages may be due to

that culling of buffalo cows at younger ages was mainly performed on the basis of fertility and health.

Age correction factors for AMY are given in Table 5. As expected, the numerical values of these factors were smaller than those factors for 305 MY before the age of maximum production. After the mature age was reached, the factors became larger. However, the differences between these factors were very small. (Tables 4 and 5 & Fig. 1).

Table 4. Multiplication factors (CF) for adjustment of 305-day milk yield for age at calving

Age (mo)	CF	Age (mo)	CF	Age (mo)	CF	Age (mo)	CF	Age (mo)	CF
30	1.260	60	1.094	90	1.018	120	1.001	150	1.036
31	1.253	61	1.091	91	1.017	121	1.001	151	1.038
32	1.245	62	1.087	92	1.015	122	1.001	152	1.041
33	1.238	63	1.084	93	1.014	123	1.002	153	1.043
34	1.230	64	1.080	94	1.013	124	1.002	154	1.046
35	1.224	65	1.077	95	1.012	125	1.003	155	1.048
36	1.217	66	1.074	96	1.010	126	1.004	156	1.050
37	1.210	67	1.071	97	1.009	127	1.004	157	1.053
38	1.204	68	1.067	98	1.008	128	1.005	158	1.056
39	1.197	69	1.064	99	1.007	129	1.005	159	1.059
40	1.191	70	1.061	100	1.006	130	1.007	160	1.062
41	1.185	71	1.059	101	1.005	131	1.008	161	1.065
42	1.179	72	1.056	102	1.005	132	1.009	162	1.067
43	1.174	73	1.053	103	1.004	133	1.009	163	1.071
44	1.168	74	1.050	104	1.004	134	1.010	164	1.074
45	1.162	75	1.048	105	1.003	135	1.012	165	1.077
46	1.158	76	1.045	106	1.002	136	1.013	166	1.081
47	1.152	77	1.043	107	1.002	137	1.014	167	1.084
48	1.147	78	1.041	108	1.001	138	1.015	168	1.088
49	1.142	79	1.038	109	1.001	139	1.017	169	1.092
50	1.137	80	1.036	110	1.001	140	1.019	170	1.095
51	1.132	81	1.034	111	1.001	141	1.020	171	1.099
52	1.127	82	1.032	112	1.001	142	1.022	172	1.102
53	1.123	83	1.030	113	1.000	143	1.023	173	1.107
54	1.119	84	1.028	114	1.000	144	1.025	174	1.111
55	1.114	85	1.026	115	1.000	145	1.027	175	1.115
56	1.110	86	1.024	116	1.000	146	1.029	176	1.120
57	1.106	87	1.023	117	1.000	147	1.030	177	1.124
58	1.102	88	1.021	118	1.000	148	1.032	178	1.128
59	1.098	89	1.020	119	1.001	149	1.035	179	1.133

Table 5. Age correction factors (CF) for annualized milk yield of Egyptian buffaloes

Age (mo)	CF	Age (mo)	CF	Age (mo)	CF	Age (mo)	CF	Age (mo)	CF
30	1.144	60	1.046	90	1.004	120	1.007	150	1.055
31	1.140	61	1.044	91	1.004	121	1.008	151	1.057
32	1.136	62	1.042	92	1.003	122	1.008	152	1.060
33	1.131	63	1.040	93	1.003	123	1.009	153	1.062
34	1.127	64	1.038	94	1.002	124	1.010	154	1.066
35	1.123	65	1.036	95	1.002	125	1.011	155	1.068
36	1.119	66	1.034	96	1.001	126	1.012	156	1.071
37	1.116	67	1.032	97	1.001	127	1.014	157	1.074
38	1.111	68	1.030	98	1.001	128	1.015	158	1.076
39	1.107	69	1.028	99	1.000	129	1.016	159	1.080
40	1.104	70	1.027	100	1.000	130	1.017	160	1.083
41	1.101	71	1.025	101	1.000	131	1.019	161	1.086
42	1.097	72	1.023	102	1.000	132	1.020	162	1.089
43	1.093	73	1.022	103	1.000	133	1.022	163	1.093
44	1.089	74	1.021	104	1.000	134	1.023	164	1.096
45	1.086	75	1.019	105	1.000	135	1.025	165	1.099
46	1.083	76	1.018	106	1.000	136	1.026	166	1.103
47	1.080	77	1.016	107	1.000	137	1.028	167	1.106
48	1.077	78	1.015	108	1.001	138	1.030	168	1.111
49	1.074	79	1.014	109	1.001	139	1.032	169	1.114
50	1.071	80	1.013	110	1.001	140	1.034	170	1.118
51	1.069	81	1.011	111	1.002	141	1.035	171	1.123
52	1.066	82	1.010	112	1.002	142	1.037	172	1.126
53	1.063	83	1.009	113	1.003	143	1.039	173	1.131
54	1.060	84	1.008	114	1.003	144	1.041	174	1.134
55	1.058	85	1.008	115	1.004	145	1.043	175	1.139
56	1.055	86	1.007	116	1.004	146	1.046	176	1.143
57	1.053	87	1.007	117	1.005	147	1.048	177	1.148
58	1.050	88	1.006	118	1.006	148	1.050	178	1.153
59	1.048	89	1.005	119	1.006	149	1.052	179	1.158

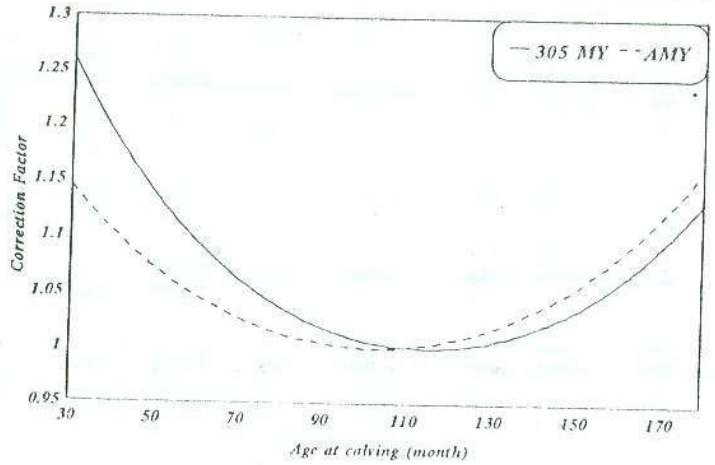

Fig. 1 : A comparison of age correction factors for annualized (AMY) and 305 milk yield (305 MY).

Days open correetion factors.

Schaeffer and Henderson (1972) reported that correction factors for DO could be computed to any arbitrary base. The base, in the present study, was considered as 120-129 days. Agjustment factors for DO across all lactations are shown in Table 6. These factors indicated that DO correction factors (DOCF) for 305 MY decreased with the increase of DO. While, the corresponding factors for AMY increased by increasing of DO (Table 6. and Fig 2). Second degree polynomial regression equations used in calculation of the correction factors were:

$$Y = 1246.4476 + 1.8804\ X - 0.0017\ X^2 \text{ for 305 MY}$$

$$Y = 1321.0836 - 1.343\ X + 0.0004\ X^2 \text{ for AMY}$$

Table 6. Days open correction factors for 305-day and annualized milk yield (ANY) of Egyptian buffaloes[a]

Days open class	Factor		Days open class	Factor	
	305 MY	AMY		305 MY	AMY
30 - 39	1.111	0.909	170 - 179	0.955	1.056
40 - 49	1.096	0.919	180 - 189	0.947	1.067
50 - 59	1.082	0.929	190 - 199	0.940	1.079
60 - 69	1.069	0.938	200 - 209	0.933	1.090
70 - 79	1.056	0.948	210 - 219	0.926	1.103
80 - 89	1.044	0.958	220 - 229	0.919	1.115
90 - 99	1.032	0.968	230 - 239	0.912	1.127
100 - 109	1.021	0.979	240 - 249	0.907	1.141
110 - 119	1.010	0.989	250 - 259	0.901	1.153
120 - 129	1.000	1.000	260 - 269	0.895	1.167
130 - 139	0.990	1.010	270 - 279	0.890	1.180
140 - 149	0.981	1.021	280 - 289	0.885	1.194
150 - 159	0.972	1.032	290 - 299	0.880	1.207
160 - 169	0.964	1.044	300 - 309	0.875	1.221

a = Days open class of 120 - 129 was used as base for construction the correction factors

The numerical values of the factors were larger in shorter DO periods than longer ones. The decreasing rate of the magnitude of DO Factors for shorter DO periods were higher than those for longer ones (Schaeffer and Henderson, 1972, Schaeffer et al., 1973, Khattab and Ashmawy, 1988, Khalil et al., 1992 and 1994).

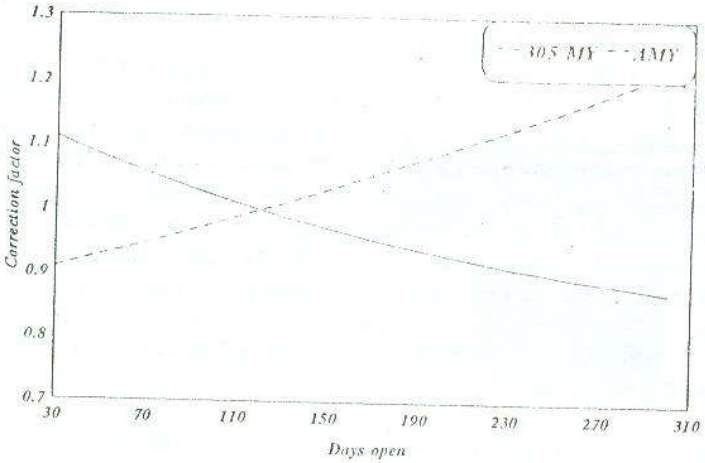

Fig. 2 : A comparison of days correction factors for annualized (AMY) and 305 milk yield (305 MY).

Repeatability estimates

Estimates of repeatability (t) and their standrad errors for defferent traits are presented in Table 1. The estimates of repeatability for yield traits studied (0.30-0.35) are in the range of values obtained by asker et al. (1965); white et al,(1981); Kaushik et al. (1984), Abubakar et al, (1986); Ashmawy,(1991) and sadek et al. (1993). The estimates for interval traits were slightly lower than those of yield traits. While, the estimate for CI was the lowest value (0.08±0.02). This means that CI is to a great extent under the control of management and it can have, at best, little genetic component (Ashmawy, 1991) .

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معاملات التعديل للعمر عند الولادة والأيام المفتوحة ومعامل التكرار للصفات الإنتاجية والبيئية فى الجاموس المصرى

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استخدمت فى هذه الدراسة ٢٦٧٣ سجلا أنتجتها ٦٥٣ جاموسة مصرية ولدت فى الفترة ١٩٧٠ – ١٩٨٥ ٠ جمعت هذه السجلات من ثلاث مزارع تابعة لوزارة الزراعة فى منطقة محلة موسى بمحافظة كفر الشيخ ٠ وتم تحليل البيانات بإستخدام طريقة الحد الأدنى للمربعات لتحليل التباين ٠ وحساب معاملات الإنحدار بهدف إستخراج معاملات التعديل للعمر عند الولادة ومعاملات التعديل للأيام المفتوحة للجاموس المصرى لإستعمالها فى تصحيح السجلات فى منطقة محلة موسى ٠

وتلخصت النتائج فيما يلى :

١– متوسط الإنتاج الكلى للبن والإنتاج فى ٣٠٥ يوم والإنتاج السنوى هو ١٦٨٧، ١٥٧٦، ١٠١١ كجم على الترتيب ٠

٢– متوسط أيام الحليب والجفاف والفترة بين الولادتين كان ٣٠١، ٢٢٦، ٥٢٤ يوم، على الترتيب ٠

٣– تأثير الجاموسة داخل المزرعة وسنة وشهر الولادة والأيام المفتوحة كان معنويا (٥٪ ، ١٪) على معظم الصفات المدروسة٠ تأثير المزرعة كان غير معنويا على هذه الصفات المدروسة٠

٤– تأثير العمر عند الولادة (الجزء الخطى) كان غير معنويا على هذه الصفات بينما كان تأثير الجزء المربع معنويا على معظم الصفات المدروسة.

٥– أوضحت نتائج تحليل الإنحدار وجود علاقة غير خطية (منحنية) بين صفات محصول اللبن والصفات البينية على كل من العمر عند الولادة والأيام المفتوحة ٠

٦– تم حساب معاملات التعديل للعمر عند الولادة واحتوت نتائج جداول التعديل على المعاملات إبتداء من عمر ٣٠ شهر وحتى عمر ١٧٩ شهر، وذلك لإستعمالها فى تعديل السجلات للجاموس المصرى ٠

٧– حسبت معاملات التعديل للأيام المفتوحة وذلك للإنتاج فى ٣٠٥ يوم والإنتاج السنوى لإستعمالها لتعديل السجلات لهذا العامل عند إجراء المقارنة بين أفراد الجاموس ٠

٨– قيم المعامل التكرارى (ك) لكل من صفة الإنتاج الكلى والإنتاج فى ٣٠٥ يوم ، الإنتاج السنوى هى ٠,٣٥ ، ٠,٣٣ ، ٠,٣٠ على الترتيب٠ قيم المعامل التكرارى لأيام الحليب والجفاف هى ٠,٣٠ ، ٠,٣٠ ، على الترتيب وكانت قيمة أقل للفترة بين الولادتين حيث بلغت ٠,٠٨.

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GROWTH PERFORMANCE OF BUFFALO MALE CALVES AS AFFECTED BY USING COWPEAS AND SOYBEAN SEEDS AS A SOURCE OF UREASE DURING UREA-TREATED WHEAT STRAW ENSILING PROCESS

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SUMMARY

A study was conducted to examine the effect of cowpeas and soybean seeds as sources of urease on the nutritive value of urea treated ensiled wheat straw. Twenty four buffalo calves divided into 4 groups, 6 animals in each group. Four isonitrogenous and isoenergetic rations, containing untreated wheat straw or treated with 4% urea with or without the source of urease enzyme, were prepared. The animals were fed ad libitum for 90 days. The average daily dry matter intake of ration containing untreated wheat straw, 4% urea treated wheat straw, 4% urea treated wheat straw with 1% cowpeas seed and 4% urea treated wheat straw with 1% soybean seed as a urease source were 6.234, 7.045, 6.656 and 6.503 kg, respectively. The average daily weight gain of calves fed respective rations were 0.107, 0.363, 0.442 and 0.383 kg and feed efficiency for weight gain were 58.04, 19.41, 15.04 and 16.96 respectively. The animals fed urea treated straw rations had better ($P<0.01$) weight gain and feed efficiency as compared to those fed untreated straw containing rations.

Keywords: Growth performance, buffalo male calves, urea treated wheat straw, cowpea, soybeans

INTRODUCTION

Availability of quality forages in sufficient quantity is an important dietary acquirement for any ruminant production system. One of the main bottlenecks for profitable livestock keeping in Pakistan is the scarcity of forage because of increasing allocation of acreage for the production of grains to meet the dietary needs of ever increasing human population. Hence under present conditions the livestock in Pakistan is receiving about 50% of their required energy, resulting in low productivity (Sarwar et al., 1992).

The shortage of good quality forage can be overcome by improving the feeding value of abundantly available poorly digestible crop residues in the country. Improvement in the feeding values of straws and other crop residues through chemical treatments is being investigated vigorously. Ali et al. (1977) reported imported digestibility of organic matter of diets containing NaOH treated wheat straw. Similar findings were reported by Sarwar et al. (1985 and 1992) when they fed diets containing wheat straw treated with NaOH to buffalo heifers. Ammonia has also been used to improve the nutritive value of low quality roughages (Sundstol et al., 1978). Sadullah et al. (1982) and Ali et al. (1993) used urea for straw ammoniation because urea is rapidly decomposed into ammonia by the action of urease in aqueous medium. This enzyme is abundantly present in soybeans (Katsitodze et al., 1974) but not enough in wheat straw to affect the decomposition of urea (Coxworth and Kullman, 1978). The present study was conducted to investigate the effectiveness of urease enzyme from cowpeas and soybean seeds for the improvement of nutritive value of urea treated wheat straw fed to growing buffalo calves.

MATERIALS AND METHODS

Treatment of wheat straw

Wheat straw was treated with 4% (w/w) urea solution and ensiled in four different stacks for a period of 30 days. In the control stack the wheat straw was treated with equal weight of water only. In the second stack wheat straw was sprayed with 4% urea solution (w/w). In the third and fourth stacks addition of 1% crushed

cowpeas or soybeans were added as a source of urease, respectively. Each stack was covered with 4 inches thick layer of rice straw, followed by polyethyline sheet covering which was plastered with a blend of wheat straw and mud to avoid any cracking on drying. The stacks were allowed to react for 30 days and it was assumed that polyethyline and mud plastering provided anaerobic conditions for proper silage making. On 31st day the stacks were opened and straw silage samples were obtained for further use in production trial.

Feeding and digestion trials

Four isonitrogenous and isoenergetic rations (Table 1) were prepared by using NRC values (1988). Twenty four buffalo calves of about one year (10-12 mo.) age and same weight were divided into 4 groups, 6animals each. The experiment was planned as randomized complete block design. The experimental rations were randomly allotted to these groups. The animals were allowed 15 days adjustment period, followed by 90 days experimental period. Prior to the start of the experiment, the animals were treated against the ecto- and endo-parasites. The rations were mixed daily and fed twice (a.m. & p.m.) ad. libitum. The animals were offered clean water three times a day. Animals were weighed forthinghtly for three consecutive days before the morning feeding.

The total feces collection procedure was used to determine the digestibility during last 10 days of the trial. All the 24 experimental animals were involved in the digestion trial. The feces of each animal were transferred to respective metal tubs several times daily. The total feces were thoroughly mixed with a wooden spatula and weighed, and a 1% sample was taken with a special coring tube at the end of each 24 hours period. The dry matter contents of the feces were determined. The dry matter contents of the rations were determined every day by obtaining a representative sample before feeding. The data for feed intake and weight gain were maintained accordingly. Analyses of feeds and feces were determined by the official A.O.A.C (1984) methods. The data thus collected were subjected to analysis of variance (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Growth performance

The means for weight gain, feed consumption and feed efficiency are shown in Table 2. The buffalo calves fed rations containing untreated wheat straw, urea treated wheat straw and urea treated wheat straw + cowpeas or soybean gained, on an average, 0.107, 0.363, 0.442 and 0.383 Kg body weight daily, respectively. The calves fed rations containing straw treated with urea as well as cowpeas and soybean gained significantly ($P<0.05$) more weight than those fed the ration containing untreated wheat straw. However, the weight gained by the calves fed the three experimental rations containing treated straw were significantly different from each other. A significant increase in weight gain in animals fed rations containing urea treated wheat straw have also been reported by Al-Rabbat and Heaney (1978), Sundstol et al. (1978) and Haque et al. (1984). The improvement in body weight gain due to rations containing urea treated wheat straw as compared to control ration which had 1.2% urea (Table 1) could be due to slow release of ammonia in the rumen, traped in the fibre matrics during ensiling process. The slow release of ammonia in the rumen not only minimizes its ruminal losses but also increases the activity of ureolytic bacteria (Slyter et al., 1971) and possibility synchrony of NH_3 and energy availability for maximal microbial protein synthesis.

Feed consumption and digestibility

The average daily dry matter intake by calves fed rations containing untreated wheat straw, urea treated wheat straw and urea treated wheat straw plus cowpeas or soybeans were 6.234, 7.045, 6.656 and 6.503 kg (Table 2), respectively. The analysis of variance of the data revealed non significant differences among the groups. In contrast to our results, Sadullah et al. (1982) and Al-Rabbat et al. (1978) have reported significantly ($P<0.05$) higher dry matter intake by cattle fed roughage based rations containing urea or ammonia treated straw. In this study, the non significant variation in feed intake due to ammoniation of the wheat straw might be due to (1) non-significant changes in the digestibility of the rations and/ or (2) the straw contributed only 35% of the ration which is

not expected to make much changes in the gut fill.

Table 1: Composition of experimental rations

Ingredients as fed, %	Rations A	B	C	D
Cotton seed cake (undecoricated)	20	20	20	20
Rape seed cake	10	10	14	14
Wheat bran	14	14	14	14
Wheat straw	33.8	35	35	35
Molasses	20	20	20	20
Mineral mixture	1	1	1	1
Urea 46% (fertilizer grade)	1.2	0	0	0
Chemical composition DM basis, %				
Dry Matter	70.08	71.86	69.72	68.83
Crude protein	16.87	16.61	16.81	16.31
Crude fibre	26.46	24.85	28.37	29.13
Crude lipid	4.35	3.75	4.08	4.05
Nitrogen free extract	41.04	41.13	38.65	38.92
Ash	11.28	13.66	12.09	11.59

A=Wheat straw treated with water(100 litter water/100 Kg wheat straw, B=Wheat straw treated with 4% urea solution (w/w), C=Wheat straw treated with 4% urea solution plus 1% crushed cowpeas seeds and d=Wheat straw treated with 4% urea solution plus 1% crushed soybean seeds.

Table 2. Average weight gain, dry matter intake, dry matter digestibility and feed efficiency in growing buffalo calves fed experimental rations

Parameters	Rations A	B	C	D
No. of animals	6	6	6	6
Days on experiment	90	90	90	90
Average initial body weight (kg)	173.17	173.17	173.17	173.17
Average final body weight (kg)	182.83	205.83	213.00	207.67
Average total weight gain (kg)	9.66	32.66	39.83	34.50
	a	b	c	c
Average daily weight gain(kg)	0.107	0.363	0.442	0.383
Average daily dry matter intake (kg)	6.234	7.045	6.656	6.503
DM digestibility (%)	65.74	69.30	68.13	67.40
Feed efficiency (dry matter intake/weight gain)	a 58.26	b 19.41	c 15.06	c 16.98

a, b, c Means in the same row having different superscript differ significantly ($P<0.05$)

The apparent dry matter digestibility values (Table 2) were 65.74, 69.30, 68.13 and 67.40% in animals fed rations containing untreated wheat straw, urea treated wheat straw, wheat straw treated with urea plus cowpeas or soybean, respectively. The rations containing urea treated wheat straw showed an increasing trend of digestibility. However, the differences were non significant when results were subjected to analysis of variance. These results agreed with the earlier reports of Ali et al. (1993), Dolbery et al. (1981), Shea et al. (1980) and Altaf-ur-Rehman (1985). Ali et al. (1993) pointed out that small improvement in the dry matter digestibility of the ration containing ammoniated wheat straw due to the fact that the digestibility of the total mixed ration was not true measurement of the improvement for the digestibility of the wheat straw alone.

Feed efficiency

The average amount of dry matter consumed by calves to gain one Kg body weight was 58.26, 19.41, 15.06 and 16.98 Kg for rations containing untreated wheat straw, urea treated wheat straw, urea treated wheat straw with cowpeas or soybeans, respectively. Similar results were reported by Huber and Kung (1981). They mentioned that growing heifers showed reduced growth when fed rations supplying 45% of the total CP from NPN. In our study, more than 40% of the total nitrogen came from NPN and thus the reduced growth may be due to negative reaction of growing calves to dietary NPN.

CONCLUSION

Replacement of wheat straw with urea ensiled straw did not significantly improve the dry matter intake by buffalo calves. However, feed efficiency of buffalo calves fed ration containing 35% urea ensiled straw was significantly greater when compared to those fed control ration. Addition of urease sources in rations containing urea ensiled straw further improved the efficiency of the buffalo calves as compared to the control as well as urea ensiled straw rations. The ration containing urease sources showed significantly greater weight gain and feed efficiency as compared to those without urease sources. However, no difference was observed between the

two sources of urease i.e. cowpeas and soybean seeds. The results of average daily gain and feed efficiency indicated that addition of urease can be practised in urea ensiling straw, however, the cost factor, which varies from place to place, must be considered.

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إستخدام لوبيا العلف وفول الصويا كمصدر لإنزيم اليوريز خلال سيلجة تبن القمح المعامل باليورياو تأثيره على نمو عجول الجاموس.

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درس تأثير إضافة لوبيا العلف وفول الصويا كمصدر لإنزيم اليوريز على القيمة الغذائية لتبن القمح المعامل باليوريا بإستخدام أربعة وعشرون عجل جاموس فى أربع مجموعات كل تحتوى ستة عجول غذيت على علائق متساوية الطاقة والنيتروجين لمدة ٩٠ يوما. وتكونت العلائق من تبن قمح غير معامل ، أو معامل بيوريا بنسبة ٤٪ بدون أو مع مصدر لإنزيم اليوريز .

أوضحت النتائج أن متوسط المأكول من المادة الجافة بلغ ٦,٢٣٦ ، ٧,٠٥٤، ٦,٦٥٦ ، و٦,٥٠٣ كجم يوميا للرأس أما الزيادة اليومية فى وزن العجول فكانت ٠,١٠٧ ، ٣٦٣ ، ٠,٤٤٢ و٠,٣٨٣ كجم . و القيم المقابلة للكفاءة الغذائية ٥٨,٢٦ ، ١٩,١٤ ، ١٥,٠٤ و١٦,٩٦ وذلك للعلائق الأربع على الترتيب .

وقد أثبتت النتائج أن الحيوانات المغذاة على العلائق المحتوية على تبن القمح المعامل باليوريا أظهرت زيادة يومية فى الوزن أعلى منها للحيوانات المغذاة على تبن القمح الغير معامل .

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SUN DRIED BROILER LITTER IN LACTATING DAIRY BUFFALO RATIONS

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SUMMARY

A total of 27 lactating buffalo cows at lactation different seasons were used to study the effect of using various levels of sun dried broiler litter (BL) in ration for lactating dairy buffaloes on milk production and composition. Animals were divided into three similar groups of 9 heads each and were fed three experimental ration, where 0,30 and 60% of the concentrate nitrogen was replaced in T_1, T_2, and T_3 by BL nitrogen respectively.

The results showed what using medium level of BL (T_2) in dairy buffaloes had no significant effect ($P>0.05$) on milk production. However, using high level of BL resulted in significant ($P<0.05$) increase in milk yield compared with other treatments. There were significant differences due to the treatments, season and the interaction between them.

The overall mean of 4% fat corrected milk (FCM) through experimental lactation period (39 wk) for T_1, T_2 and T_3 were 2222, 2192 and 2582 kg respectively. In addition, inclusion of low level BL in dairy buffalo ration had no negative effect on butter fat production. Moreover, using high levels of BL resulted in an increas ($P<0.05$) in butter fat production; ($P<0.01$) total protein yeild and ($P<0.05$) lactose yield.

Keywords: Sun dried broiler litter, animal wastes, dairy buffaloes milk composition

INTRODUCTION

Recently there has been a world wide great deal of interest in using poultry wastes in ruminants rations as potential sources of nitrogen. In Egypt, poultry waste is available in plenty during the year. The total annual production may reach 2 million metric ton having a gross dry matter weight of about 800,000 tons. Considerable research has shown high nutritional value and favorable performance of beef cattle (Creger, et al, 1973; Fontenote and Webb, 1974); dairy cattle (Smith and Fries, 1973, Parthasarathy and Pradhan, 1985) and sheep (Khamis, et al., 1992) raised on rations containing poultry wastes.

The researchs are lacking , however, with commercially sun dried poultry wastes for lactating dairy animals. If dried poultry waste is ever to become a commercial feed, more research is needed to know the maximum amounts that can be fed for optimum performance.

Therefore, the objective of this trial was to study the effect of using two levels of sun dried broiler litter in complete ration for lactating dairy buffaloes on milk production and composition.

MATERIALS AND METHODS

This study was carried out at the experimental station of Milk Replacer Research Center, Faculty of Agriculture, Ain Shams University.

A total of 27 lactating buffalo cows at different lactation seasons were used in this trial. Animals were divided into three similar groups of 9 heads each, where each group consisted of 3 animals at the first, second and third lactating seasons. The animals of treatment 1 (T_1) received a control diet which consisted of concentrate feed mixture (CFM) and berseem hay plus rice straw as roughage. Concentrate: roughage ratio was 70:30.

Animals of T_2 and T_3 were fed the control diet but 30 and 60% of the concentrate nitrogen was replaced by broiler litter (BL) nitrogen, respectively. The wastes used in this study were collected from the intensive broiler production houses of El-Salam company, Cairo province. Broiler litter (wheat straw base) was spread on plastic sheets in layers of 10 cm. thickness and

shuffled every other day to be sun cured for 7 days. Then after, when the moisture content reached 10-15%, the litter was collected and stored in sacks. The chemical composition of the ingredients and nutritive values of the experimental ration are presented in Table 1.

Table 1. Chemical composition of feedstuffs and broiler litter used, (g/kg) and the components of the experimental rations

Nutrient	CFM	Berseem hay	Rice straw	BL
Dry matter	918	889	913	918
Organic matter	827	771	735	783
Ash	91	118	178	135
Crude protein	142	137	29	195
Ether Extract	44	24	19	12
Crude fiber	125	297	312	235
Nitrogen fr.ex.	516	313	375	341
T_1, %	70.0	15	15	--
T_2, %	52.0	15.9	15.9	16.2
T_3, %	31.7	16.9	16.9	34.5

The daily ration was divided into two equal portions and CFM was offered individually during milking time at 06.00 and 16.00 h. according to Shehata, 1971, allowances. The roughages were offered at 08:00 and 14:00 h daily after accessing the animal to fresh water.

The animals were machine milked twice daily while milk samples were collected once every two weeks for 15 weeks, then every four weeks till the end of the experimental period which extented to 39th week of lactation season. Individual daily records for milk yield were kept for each animal. Immediately after milking, milk samples were used for acidity determinations. Composed samples (morning and evening) were analyzed for total solids (TS), according to Laboratory Manual (1949). The fat percentage was estimated by Gerber method for milk according to British Standard Institution (1951). Solid not fat content was calculated by the differences between (TS) and fat contents. Lactose was determined calorimetrically according to Barnett and Abd El-Tawab (1957). Total

protein and ash were determined according to Ling (1963).

Samples of feed ingredients e.g, CFM, BL, berseem hay and rice straw were subjected to chemical analysis according to A.O.A.C (1986). for the determination of DM, CF, EE, CP & ash, while NFE and OM were calculated by differences. The program of the least square (Domon and Harvey, 1987) using the general linear model program of SAS (1985), was followed for statistical analysis using IBM computer. Tukey procedure was used to test the significancy among treatment means.

RESULTS AND DISCUSSION

Milk Yield

The average daily milk yield at the third week postpartum of the experimental animals of T_1, T_2 and T_3 were 4.20, 6.00, 4.70 kg/d; 4.27, 4.57, 5.03 kg/d and 5.67, 6.17, 6.03 kg/d for the first (S_1), second (S_2) and third (S_3) seasons, respectively (Table 2).

Milk production of S_1, S_2 and S_3 was found to be 5.33, 7.30 & 7.40 kg/d for T_1; 5.43, 7.10 & 7.47 kg/d for T_2 and 6.40, 8.30 & 7.17 kg/d for T_3, respectively, at the fifth week of lactation.

The first calvers fed the control ration, T_1, showed peak at 11th week kg/d and the production was higher than 6 kg/d for two weeks only. While the peak was achieved for those of S_2 & S_3 at the 7th week kg/d and the milk production maintained over 6 kg/d till the 15th week.

On the same time, animals fed the ration which contained low level of BL e.g 16.2% of DM (T_2) showed the peak at the 11th , 7th and 13th weeks for S_1, S_2 & S_3, respectively. The production was higher than 6 kg for S_2 & S_3 till the 23rd & 27th week of lactation. (Fig 1).

On the other hand, the peaks for S_1, S_2 & S_3 for the animals of T_3 were at 13th, 9th & 9th weeks, respectively. The daily production remained above 6 kg/d up to 19th, 31st and 23rd weeks.

A sharp rise in milk yield was recorded for different treatments at the 5th week as compared to that of the third week being 134, 144 and 122% for T_1, T_2 and T_3 respectively. On the other hand, the peak of milk yield was recorded at 7th week for the animals of T_1 and T_2 however, the curve of milk yield for the animals of T_3

Table 2. Effect of inclusion rations with different levels of broiler litter on averages milk yield of buffaloes'milk during different lactation stages

Week of Lactation	Milk Yield (Kg/day) T1 S_1	T1 S_2	T1 S_3	T2 S_1	T2 S_2	T2 S_3	T3 S_1	T3 S_2	T3 S_3
3	4.20 ± 0.87	6.00 ± 0.80	4.70 ± 1.62	4.27 ± 0.89	4.57 ± 0.38	5.03 ± 0.94	5.67 ± 0.58	6.17 ± 1.19	6.03 ± 0.37
5	5.33 ± 0.72	7.30 ± 0.96	7.40 ± 0.20	5.43 ± 0.89	7.10 ± 0.86	7.47 ± 0.94	6.40 ± 0.57	8.30 ± 1.20	7.17 ± 0.52
7	5.77 ± 0.75	10.27 ± 3.48	8.03 ± 0.15	5.60 ± 0.75	7.80 ± 0.69	7.63 ± 0.69	6.40 ± 0.72	8.77 ± 1.07	7.83 ± 1.22
9	6.13 ± 0.71	6.73 ± 0.43	8.03 ± 0.43	5.57 ± 0.45	7.40 ± 0.96	7.83 ± 0.44	6.73 ± 0.93	9.13 ± 0.69	8.13 ± 1.62
11	6.27 ± 0.94	6.73 ± 0.35	7.27 ± 0.39	5.60 ± 0.67	7.23 ± 0.55	7.63 ± 0.62	6.87 ± 0.52	8.80 ± 1.46	7.93 ± 1.47
13	6.13 ± 0.73	6.63 ± 0.55	6.83 ± 0.17	5.40 ± 0.78	7.03 ± 0.52	7.93 ± 0.88	7.53 ± 0.79	9.07 ± 1.11	7.73 ± 1.70
15	5.83 ± 0.74	6.20 ± 0.87	6.43 ± 0.38	4.53 ± 0.86	7.23 ± 0.32	7.17 ± 0.71	6.57 ± 0.62	8.23 ± 1.13	7.03 ± 1.24
19	5.53 ± 0.84	5.63 ± 0.91	5.97 ± 0.42	4.77 ± 0.71	6.67 ± 0.17	7.17 ± 0.84	6.07 ± 0.59	7.83 ± 1.24	6.60 ± 1.59
23	5.33 ± 0.86	5.30 ± 0.89	5.17 ± 0.64	4.80 ± 0.72	6.27 ± 0.34	6.77 ± 0.75	5.83 ± 0.95	6.00 ± 1.27	5.87 ± 1.13
27	5.40 ± 0.38	5.40 ± 0.98	5.27 ± 0.69	4.47 ± 0.75	5.47 ± 0.73	6.40 ± 0.91	5.83 ± 0.54	9.27 ± 4.27	5.73 ± 1.18
31	5.17 ± 0.33	5.10 ± 0.95	4.70 ± 0.76	3.77 ± 0.77	5.50 ± 0.72	5.37 ± 0.58	5.93 ± 0.84	6.07 ± 0.87	5.53 ± 0.99
35	4.50 ± 0.12	5.05 ± 0.98	4.43 ± 0.81	3.00 ± 0.70	5.30 ± 0.38	4.53 ± 0.39	5.17 ± 0.57	4.83 ± 0.73	5.00 ± 0.98
39	3.80 ± 0.35	4.03 ± 0.57	3.80 ± 0.47	2.57 ± 0.47	3.50 ± 0.38	3.83 ± 0.13	3.67 ± 0.35	3.97 ± 0.13	3.60 ± 0.46
Mean ± SE		5.54 ± 0.14			5.52 ± 0.14			6.34 ± 0.14	
Overall Mean ± SE			5.80 ± 0.08						

which received high level of BL (about 34.5% of dry matter intake) continued its increase till the 13 th week of lactation.

It is clear from Fig. (1) that animals of T_3 were the most persistent group. The mean milk yield for the three treatments through experimental lactating period, 39 weeks, were 1512, 1506 and 1731 kg for T_1, T_2 and T_3 respectively being highest ($P<0.05$) for T_3.

Generaly, using low level of BL in dairy buffaloes showed non significant effect ($P>0.05$) on milk production (T_1 VS T_2). However, using high level of BL (T_3) resulted in a significant increase in milk yield ($P<0.05$) compared to the other treatments. It is of interest to note that statistical analysis showed significant differences due to treatments and seasons. The interaction was also significant.

Milk yield in this experiment seemed to be within the range of buffalo production reported by Kholif (1989) being 5.71 kg/d, and Abo-El-Nor (1991) being 6.68 kg/d for Egyptian buffalo. Moreover, these results are in accordance with those for cows fed dehydarted poultry excreta, reported by Thomas et al., (1972) and Smith and Wheeler (1979).

Considering FCM production it is clear that mean daily 4% fat-corrected-milk (FCM) at the third week of T_1, T_2 and T_3, respectively were 7.64, 6.23 and 9.84 kg/d (Table 3).

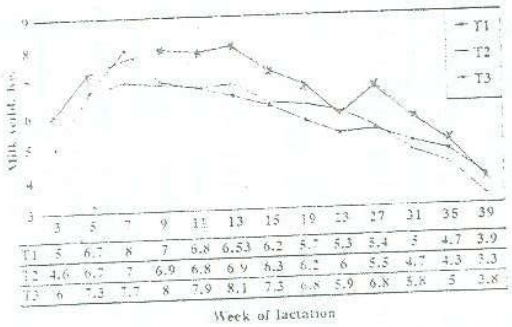
The peaks for T_1 & T_2 treatments were 9.76 and 9.46 kg 4% FCM /d respectively, at the 7th week of lactation. While milk production peak for animals of T_3 was 11.39 kg 4% FCM/d at the 19th week (Fig. 2). The mean FCM yield/day was higher than 8.0 kg/d till the 19th for T_1 and till the 31st week for both T_2 and T_3.

The overall means of FCM production through experimental lactation period (39 weeks) for T_1, T_2 and T_3 were 2222, 2192 & 2582 kg respectively, being highest ($P<0.05$) for T_3.

MILK Composition and Nutrients Yield

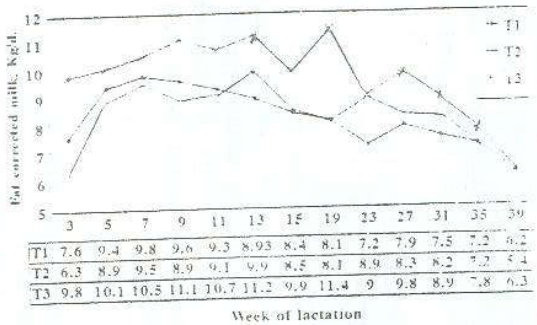
1- Fat

It should be noted that animals of T_3 showed highest milk fat percentage at different sampling times except that of the 9th week (Fig. 3). Mean daily fat yields were found to be 376, 292 and 497 g at the third week of lactation. These values increased gradually to reach



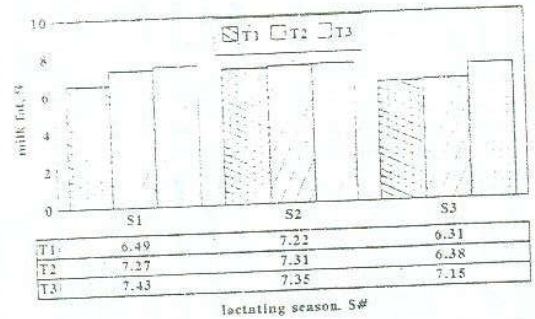
	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	5	6.7	8	7	6.8	6.53	6.2	5.7	5.3	5.4	5	4.7	3.9
T2	4.6	6.7	7	6.9	6.8	6.9	6.3	6.2	6	5.5	4.7	4.3	3.3
T3	6	7.3	7.7	8	7.9	8.1	7.3	6.8	5.9	6.8	5.8	5	3.8

Fig (1): Effect of inclusion different levels of BL in lactating buffalo ration on daily milk yeild, Kg.



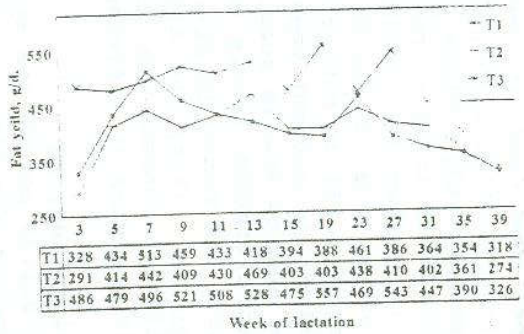
	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	7.6	9.4	9.8	9.6	9.3	8.93	8.4	8.1	7.2	7.9	7.5	7.2	6.2
T2	6.3	8.9	9.5	8.9	9.1	9.9	8.5	8.1	8.9	8.3	8.2	7.2	5.4
T3	9.8	10.1	10.5	11.1	10.7	11.2	9.9	11.4	9	9.8	8.9	7.8	6.3

Fig (2): Effect of inclusion different levels of BL in lactating buffalo ration on Fat corrected milk, Kg/d.



	S1	S2	S3
T1	6.49	7.22	6.31
T2	7.27	7.31	6.38
T3	7.43	7.35	7.15

Fig (3): Effect of inclusion different levels of BL in lactating buffalo rations on milk fat percent.



	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	328	434	513	459	433	418	394	388	461	386	364	354	318
T2	291	414	442	409	430	469	403	403	438	410	402	361	274
T3	486	479	496	521	508	528	475	557	469	543	447	390	326

Fig (4): Effect of inclusion different levels of BL in lactating buffalo ration on Fat yeild, g/d.

their peak at the 9th week for T_1 (454 g), 13th week for T_2 (455 g) and 19 th week for T_3 (577 g), (Fig. 4). Moreover, the over all means of fat yield through lactation period were 103, 104 and 128 kg fat for T_1, T_2 & T_3 respectively. These results indicate that the inclusion of BL in dairy buffalo ration had no negative affect on butter fat production. However, using high level of BL e.g. 34.5% of the diet resulted in an increase ($P<0.05$) in butter fat production of about 22% compared to the control treatment (Fig. 4).

These results are in accordance with those for dairy cows fed different levels of poultry waste, (Bull and Reid, 1971 and Thomas et al., 1972). On the other hand, Smith et al. (1976) and Arave et al. (1990) reported that milk fat content was increased when cows were fed on poultry wastes at different levels.

2- Total solids, TS

Total solids percentage started high at the beganing of the season for different treatments (Fig 5 & 6) then decreased to reach the minimum value between the 5th and 7th week for T_1 & T_2. While it was between the 9th & 11th week for T_3.

A gradual fluctuating increases were observed for different groups till their peak values at 39th week for T_1 and T_2 and at 31st week for T_3.

Total solid mean yields were 270, 268 and 310 kg for T_1, T_2 and T_3 respectively during the experimental period (39 weeks). Values of T_3 are statistically ($P<0.05$) higher than the other groups.

Values of TS recorded here were similar to those reported for buffaloes by Kholif (1989) and Abo El-Nor (1991).

Similar observations were obtained by Bull and Reid (1971) and Kneale and Garstang (1975), who reported increased values of TS content of milk when lactating cows were fed on dehydrated poultry wastes. However, Mello, et al. (1973) claimed no effect on milk composition when cows were fed 36% poultry litter containing rations. This finding is not in agreement with our results although they used the same level of our high level of BL ration. Such discrepancy may be due to different plane of nutrition, level of feeding, bedding material and waste managements.

Table 3. Effect of inclusion rations with different levels of broiler litter on mean daily fat-corrected-milk yield of buffaloes'milk during lactation period.

Week of Lactation	Fat-corrected-milk (Kg/day)								
	T1			T2			T3		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
3	6.27 ± 1.48	8.57 ± 1.58	8.07 ± 2.95	5.88 ± 1.63	6.31 ± 1.18	6.49 ± 0.98	9.42 ± 0.99	11.72 ± 3.89	8.38 ± 0.23
5	7.12 ± 0.52	11.11 ± 2.45	9.90 ± 0.79	7.02 ± 1.45	9.84 ± 0.85	9.73 ± 0.87	8.75 ± 0.83	11.64 ± 1.81	9.84 ± 0.86
7	7.98 ± 1.23	10.96 ± 2.40	10.49 ± 0.84	7.92 ± 1.85	10.59 ± 0.88	9.88 ± 0.51	9.05 ± 0.65	11.95 ± 2.51	10.44 ± 1.44
9	9.12 ± 0.75	9.19 ± 1.21	10.52 ± 0.99	7.21 ± 0.55	9.37 ± 1.63	10.14 ± 0.58	9.38 ± 1.74	12.85 ± 1.83	10.93 ± 2.08
11	9.53 ± 1.78	9.44 ± 0.99	8.87 ± 0.56	7.59 ± 1.07	9.53 ± 1.10	10.30 ± 0.72	9.16 ± 0.75	11.82 ± 2.26	11.17 ± 1.99
13	8.87 ± 0.84	9.08 ± 0.11	8.62 ± 0.52	7.39 ± 0.31	10.78 ± 0.78	11.49 ± 0.86	10.23 ± 1.01	11.86 ± 2.39	11.42 ± 2.47
15	8.31 ± 1.09	8.34 ± 1.01	8.46 ± 0.92	6.07 ± 0.73	9.59 ± 0.96	9.85 ± 1.13	9.38 ± 0.84	10.29 ± 1.25	10.14 ± 1.70
19	7.82 ± 1.49	8.79 ± 1.77	7.75 ± 0.72	7.03 ± 0.93	7.89 ± 0.74	9.42 ± 1.26	9.86 ± 1.64	14.93 ± 4.26	9.39 ± 2.14
23	7.17 ± 0.90	7.63 ± 1.63	6.64 ± 1.04	7.60 ± 1.09	10.09 ± 1.29	8.99 ± 1.16	10.30 ± 2.89	9.72 ± 2.44	9.23 ± 0.64
27	8.05 ± 0.38	8.14 ± 0.92	7.45 ± 1.51	6.65 ± 0.96	9.20 ± 1.44	8.78 ± 1.41	8.16 ± 0.69	10.24 ± 3.52	8.73 ± 1.81
31	7.31 ± 0.52	8.38 ± 1.25	6.68 ± 1.54	6.92 ± 1.90	10.01 ± 1.19	7.80 ± 1.17	8.97 ± 0.92	9.49 ± 1.34	8.28 ± 1.21
35	7.09 ± 0.27	8.11 ± 1.34	6.43 ± 1.48	5.51 ± 1.66	9.45 ± 0.94	6.54 ± 1.07	8.70 ± 0.35	7.46 ± 1.04	7.22 ± 1.42
39	5.76 ± 0.35	7.02 ± 0.73	5.85 ± 1.63	4.41 ± 0.66	6.01 ± 1.11	5.79 ± 0.49	5.89 ± 0.07	6.81 ± 0.68	6.18 ± 0.83
Mean ± SE		8.14 ± 0.22			8.03 ± 0.22			9.46 ± 0.22	
Overall Mean ± SE			8.73 ± 0.13						

3- Total protein (TP)

Fig. (7) shows that T_1 showed two peaks for milk protein percentages at the 9th and 35th weeks of lactation while the lowest total protein values (3.78%) was noticed at 3rd week of lactation.

Total protein values of T_3 were highest at the 3rd and 39th week, being 4.13 and 4.12%. Similar trend was recorded for T_2. No significant differences were detected between treatments on TP percentage, while in total protein yield, differences were highly significant where TP yields all over the experimental lactating period for T_3 was higher (73 kg) significantly ($P<0.01$) than the other two treatments (61 and 62 kg for T_1, T_2 resp.).

These results are in full agreement with those obtained by Bruhn et al. (1977) who fed cows on rations which contained poultry waste and could not detect any difference in milk protein percentage. Moreover, total protein yield values were in accordance with those reported for Egyptian buffalo's milk by Kholif (1989) being 61 kg TP/39 weeks.

4- Milk lactose content and yield

Lactose percent was 5.05% at the 3rd week and declined to 4.78% at the 5th week for T_1. In the same time, lactose percentage was highest at the third week (5.8%) and declined to 5.3% at the 5th week for T_2 (Fig 9 & 10).

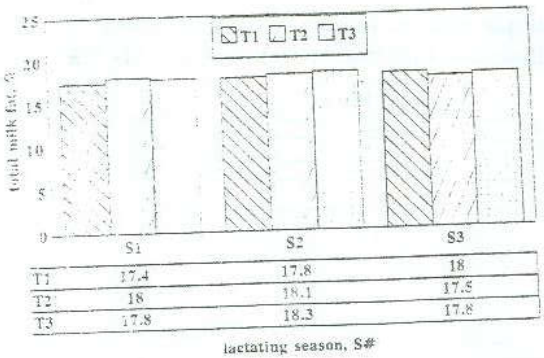
On the other hand, lactose percentage of T_3 was 5.3% at the 3rd week then increased to reach 5.5% at the fifth week. Animals fed high level of BL, e.g T_3, produced milk with higher lactose content ($P>0.05$) than those of the other two groups. The overall mean of lactose yeild through 39 weeks were 80.9, 84.2 and 93.6 kg. The same trend was recorded by Bruhn, et al. (1977).

5- Milk ash content and yield

Ash content was highest for T_1 during the first 9 weeks of lactation, then fluctuated till the 35th week and formed more than 1% at the 38th week (Fig. 11)

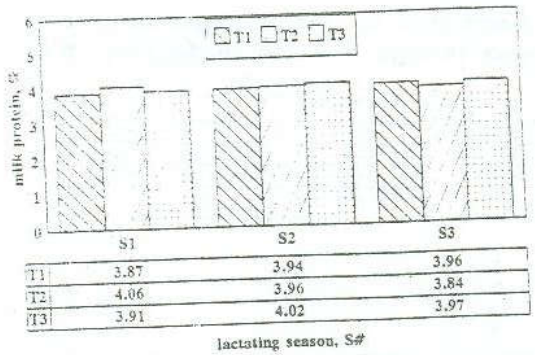
Ash percentage and total milk ash secreted by the animals of T_2 and T_3 ranged between 0.86 and 1.03%. However, ash formed more than 1% at the 23rd and 39th week of lactation season for T_2 and T_3 respectively. Differences were not significant ($P>0.05$).

The overall mean milk ash secreted during 39 weeks of lactation was 15.0, 14.6 & 16.8 kg for T_1, T_2 & T_3 resp.



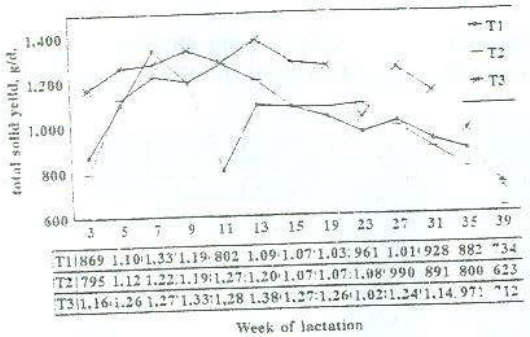
	S1	S2	S3
T1	17.4	17.8	18
T2	18	18.1	17.5
T3	17.8	18.3	17.8

Fig (5): Effect of inclusion different levels of BL in lacrating buffalo rations on the percentage of milk total solid.



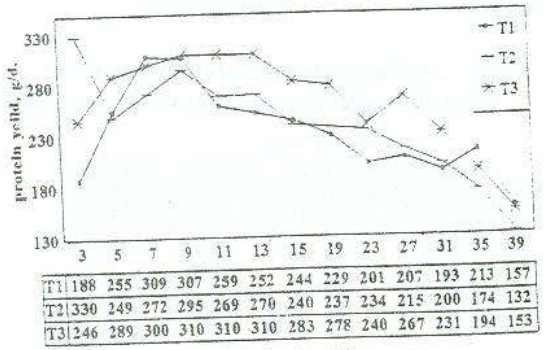
	S1	S2	S3
T1	3.87	3.94	3.96
T2	4.06	3.96	3.84
T3	3.91	4.02	3.97

Fig (7): Effect of inclusion different levels of BL in lactating buffalo rations on milk protein percent.



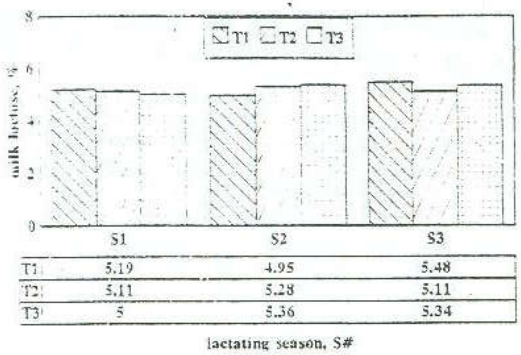
	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	869	1.10	1.33	1.19	802	1.09	1.07	1.03	961	1.01	928	882	734
T2	795	1.12	1.22	1.19	1.27	1.20	1.07	1.07	1.08	990	891	800	623
T3	1.16	1.26	1.27	1.33	1.28	1.38	1.27	1.26	1.02	1.24	1.14	971	712

Fig (6): Effect of inclusion different levels of BL in lactating buffalo ration on total solid yeild, g/d.



	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	188	255	309	307	259	252	244	229	201	207	193	213	157
T2	330	249	272	295	269	270	240	237	234	215	200	174	132
T3	246	289	300	310	310	310	283	278	240	267	231	194	153

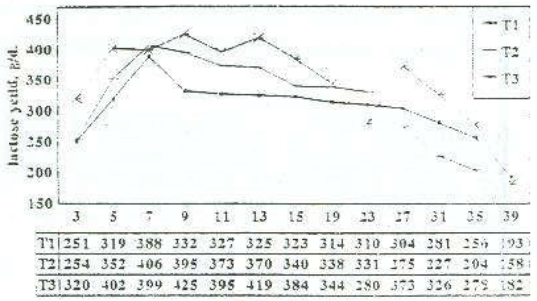
Fig (8): Effect of inclusion different levels of BL in lactating buffalo ration on protein yeild, g/d.



	S1	S2	S3
T1	5.19	4.95	5.48
T2	5.11	5.28	5.11
T3	5	5.36	5.34

lactating season, S#

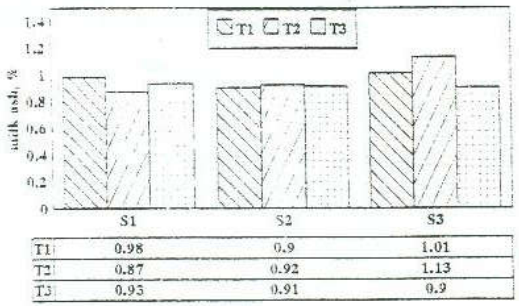
Fig (9): Effect of inclusion different levels of BL in lactating buffalo rations on milk lactose percent.



	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	251	319	388	332	327	325	323	314	310	304	281	256	193
T2	254	352	406	395	373	370	340	338	331	275	227	204	158
T3	320	402	399	425	395	419	384	344	280	373	326	279	182

Week of lactation

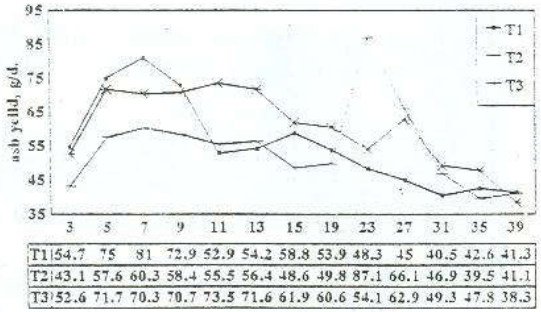
Fig (10): Effect of inclusion different levels of BL in lactating buffalo ration on lactose yeild. g/d.



	S1	S2	S3
T1	0.98	0.9	1.01
T2	0.87	0.92	1.13
T3	0.93	0.91	0.9

lactating season, S#

Fig (11): Effect of inclusion different levels of BL in lactating buffalo rations on milk ash percent.



	3	5	7	9	11	13	15	19	23	27	31	35	39
T1	54.7	75	81	72.9	52.9	54.2	58.8	53.9	48.3	45	40.5	42.6	41.3
T2	43.1	57.6	60.3	58.4	55.5	56.4	48.6	49.8	87.1	66.1	46.9	39.5	41.1
T3	52.6	71.7	70.3	70.7	73.5	71.6	61.9	60.6	54.1	62.9	49.3	47.8	38.3

Week of lactation

Fig (12): Effect of inclusion different levels of BL in lactating buffalo ration on ash yeild. g/d.

The values of ash content reported here are in accordance with those reported for Egyptian buffaloes milk by Kholif (1989) and Abo El-Nor (1991).

Results of the present study indicate that replacement of CFM nitrogen up to 60% by sun dried BL nitrogen for lactating buffalo had no negative effect neither on milk yeild nor composition. Nevertheless, increasing the replacement up to 60% of dietry nitrogen had significant increased total milk yield, fat, and protein.

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فرشة الدجاج المجففة شمسيا فى علائق الجاموس الحلاب

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لدراسة إستخدام فرشة دجاج اللحم المجففة شمسيا فى علائق الجاموس الحلاب على نتائج اللبن وتركيبه ١٠٠٠ استخدم عدد ٢٧ جاموسة فى ثلاثة مجاميع (٩ بكل مجموعة) بحيث اشتملت كل مجموعة على ثلاثة حيوانات فى كل من موسم الحليب الأول والثانى والثالث ٠
تغذت المجموعة الأولى(مجموعة المقارنة) على مخلوط العلف المركز (٧٠٪) مع دريس البرسيم وقش الأرز (٣٠٪من المادة الجافة) فى حين تغذت المجموعة الثانية والثالثة على نفس العليقة المقارنة مع إستبدال ٣٠، ٦٠٪ (على التوالى) من المواد الأزوتية لمخلوط العلف المركز بنفس الكمية من فرشة دجاج اللحم المجففة شمسيا٠
قد تم تجهيز فرشة الدجاج (قش الأرز) للتغذية بنشرها على مسطحات من البلاستيك بسمك حوالى ١٠ سم وتركها لتجف هوائيا خلال ٧أيام مع التقليب يوميا حتى تراوحت نسبة الرطوبة بها إلى ١٠-١٥٪٠
استمرت التجربة لمدة ٣٩ يوما تم فيها حلب الحيوانات ميكانيكيا واخذت عينات اللبن اولا مرة كل أسبوعين ثم مرة كل ٤ أسابيع لقياس مكونات اللبن٠
وقد أظهرت النتائج أن احتواء العليقة على٣٠٪ من فرشة الدجاج ليس له تاثير معنوى على كمية اللبن المنتجة فى حين رفع نسبة الفرشة فى العليقة إلى٦٠٪من أزوت المادة ادى إلى زيادة انتاج اللبن المنتج زيادة معنوية ٠
كما أظهرت النتائج ايضا وجود تأثيرات معنوية للمعاملات المختلفة على انتاج اللبن وتركيبه وكذلك لمواسم الحليب والتداخلات بينهم ٠
وأوضحت النتائج أن تغذية الجاموس الحلاب على عليقة بها٣٠٪ من فرشة دجاج اللحم لم يكن لها أى تأثير سالب على كمية الدهن المنتجة فى حين ارتفاع نسبة الفرشة فى العليقة ادى إلى زيادة معنوية فى انتاج الدهن والبروتين واللاكتوز ٠