# RAISING BUFFALO CALVES ON COW'S MILK

BY

**Saleh, M. S[1].; M. M. Bendary[2] and K. F. Elready[2]**

**[1] Dept. of Anim. Prod., Fac. of Agric., Kafr El-Sheikh University, Egypt.**
**[2] Anim. Prod. Res. Institute, Agric. Res. Center, Ministry of Agriculture.**

## ABSTRACT

Thirty-two newborn buffalo calves (16 male and 16 female) were used in a feeding trial through suckling period (from the 7th day to weaning at 105 days old). Animals were divided into four similar groups (8 calves each, 4 from each sex). Calves were suckled 100 % buffalo s milk in group 1 ($G_1$ control), but calves were suckled milk mixture contained 50% buffalo s milk and 50% cow s milk in group 2 ($G_2$) or milk mixture contained 25% buffalo s milk and 75% cow s milk in group 3 ($G_3$), while calves were suckled 100% cow s milk in group 4 ($G_4$). Cow s milk was supplemented with 3% fat powder. Calf starter and berseem hay were offered for each calf in all tested groups *ad lib.* from the 2nd week of age. Results indicated that, values of TND, DE and DCP for tested rations were ranged from 80.7-82.0%, 3.6 Mcl/kg and 14.3-15.0%, respectively. Calves in G1 recorded the highest ($P<0.05$) daily gain (0.72 kg) followed by G2, G3 and G4 being 0.68, 0.68 and 0.67 kg. respectively. No significant differences were observed for values of feed conversion efficiency (expressed as DM, TDN, DE and DCP/kg gain). Values of rumen liquor parameters (pH, VFA's and $NH_3$-N) were suitable for rumen activity of calves. Moreover, values of blood constituents were within the normal range of blood plasma for suckling buffalo calves. The low price of cow s milk compared to buffalo s milk lead to decrease of feed cost and improve economical efficiency of calves. Feed cost declined by 7.2, 13.7 and 19.1% and economical efficiency improved by 7.6, 15.1 and 23.5 %, for $G_2$, $G_3$ and $G_4$, respectively compared to the control ($G_1$). Furthermore, no healthy troubles or bad effects were observed on calves performance throughout suckling period.

***Keywords:*** *Buffalo calves, buffalo's milk, cow's milk, rumen fermentation and growth rate.*

## INTRODUCTION

In Egypt, there are about 3.1 million buffaloes (FAO, 1998). It contributes about 70 % of domestic milk production. Furthermore, over 90 % of buffaloes population exists in small herds which ranged from 1 to 3 heads that suckle by traditional method for four months as a natural suckling period that considered very expensive because the price of buffalo's milk is almost double that of cattle milk (Nigm, 1996). There is an increasing demand for animal products especially meat and milk, due to the steady increase of population and improvement of the living standard (Rashed, 2004). Buffalo's milk characterized by higher fat content (7.1%) and solids not fat (10.4%). Moreover, it is very acceptable by Egyptian peoples and used for making the highest priced cheese (Hegazi *et al.*, 2005).

Most of small holders resort to separate calves from their dams at early age and sell these calves as veal meat due to their need to buffalo's milk in human consumption or sell it as a cash crop because of its high price, which lead to spend uselessly on the animal wealth. Some farmers bought the newborn buffalo calves and suckle it on the cow's milk. However, this rearing system has disadvantages such as low growth and high mortality rate of calves because the farmers are applied this system by a random method. Therefore in this study, we are trying to overcome these disadvantages by introducing some modifications in rearing system of newborn buffalo calves. Moreover, using an alternative system in rearing buffalo calves lead to decrease the calf losses and increase numbers of replacement heifers that resemble a base stone in herd making. The objective of the current study was to investigate the effect of substitution of buffalo's milk with cow's milk on the nutrient digestibility, rumen and blood parameters and growth performance of buffalo calves during suckling period.

## MATERIALS AND METHODS

The present study was carried out at Gemmieza Animal Production Farm, belonging to the Animal Production Research Institute, Ministry of Agriculture. Thirty-two newborn buffalo calves (16 male and 16 female) were used in a feeding trial through suckling period (from the 7$^{th}$ day to weaning at 105 days old). The averages initial live body weight (LBW) were 42.00 $\pm$ 0.76 kg for male and 39.19 $\pm$ 0.66 kg for female. Calves

were removed from their dams after having the colostrum for three days after calving directly. Animals were divided into four similar groups (8 calves each, 4 from each sex) according to their LBW. Calves were suckled 100 % buffalo s milk according to farm regime in group 1 ($G_1$ control). but calves were suckled milk mixture contained 50% buffalo s milk and 50% cow s milk in group 2 ($G_2$) or milk mixture contained 25% buffalo s milk and 75% cow s milk in group 3 ($G_3$), while calves were suckled 100% cow s milk in group 4 ($G_4$). All calves were suckled milk according to allowances of APRI (1997) for suckling buffalo calves as shown in Table 1.

**Table (1): Feeding regime on whole buffalo and cow s milk from the 1st day of age till weaning at 105 days old (kg/calf/day).**

| Age | Tested groups* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $G_1$ | | $G_2$ | | $G_3$ | | $G_4$ | |
| | BM | CM | BM | CM | BM | CM | BM | CM |
| 1st - 3rd day | Colosterum | | | | | | | |
| 4th –7th day | 4.50 | - | 4.50 | - | 4.50 | - | 4.50 | - |
| 2 weeks | 5.00 | - | 2.50 | 2.50 | 1.25 | 3.75 | - | 5.00 |
| 3 weeks | 5.50 | - | 2.75 | 2.75 | 1.40 | 4.10 | - | 5.50 |
| 4 weeks | 6.00 | - | 3.00 | 3.00 | 1.50 | 4.50 | - | 6.00 |
| 5 weeks | 5.50 | - | 2.75 | 2.75 | 1.40 | 4.10 | - | 5.50 |
| 6 weeks | 5.00 | - | 2.50 | 2.50 | 1.25 | 3.75 | - | 5.00 |
| 7 weeks | 4.50 | - | 2.25 | 2.25 | 1.10 | 3.40 | - | 4.50 |
| 8 weeks | 4.00 | - | 2.00 | 2.00 | 1.00 | 3.00 | - | 4.00 |
| 9 weeks | 3.50 | - | 1.75 | 1.75 | 0.90 | 2.60 | - | 3.50 |
| 10 weeks | 3.00 | - | 1.50 | 1.50 | 0.75 | 2.25 | - | 3.00 |
| 11 weeks | 2.50 | - | 1.25 | 1.25 | 0.60 | 1.90 | - | 2.50 |
| 12 weeks | 2.00 | - | 1.00 | 1.00 | 0.50 | 1.50 | - | 2.00 |
| 13 weeks | 1.50 | - | 0.75 | 0.75 | 0.40 | 1.10 | - | 1.50 |
| 14 weeks | 1.50 | - | 0.75 | 0.75 | 0.40 | 1.10 | - | 1.50 |
| 15 weeks | 1.00 | - | 0.50 | 0.50 | 0.25 | 0.75 | - | 1.00 |
| Total milk, kg | 371.50 | - | 194.75 | 176.75 | 106.90 | 264.60 | 18.00 | 353.50 |

* Calves in all tested groups were suckled colosterum from their dams from 1st - 3rd day and whole buffalo s milk from 4th –7th day. **BM**: buffalo s milk. **CM**: cow s milk. $G_1$: 100% whole buffalo s milk. $G_2$: Mixture of 50% buffalo s milk + 50% cow s milk. $G_3$: Mixture of 25% buffalo s milk + 75% cow s milk. $G_4$: 100% whole cow s milk.

The fresh water was freely available. As well as. artificial rearing system was applied for all calves. The daily amount of milk was divided

into two equal meals at 8.0 a.m and 4.0 p.m, but at the 10th week of age milk was given once daily at morning only and adjusted weekly according to farm regime (Table 1). Cow s milk used for suckling calves in $G_2$, $G_3$ and $G_4$ was mixed daily with 3% fat powder, which consisted of 97% fat and 3% methionine analog. The percentages of individual fatty acids in fat powder were 19.95% palmitic, 0.30% palmitoleic, 3.0% stearic, 20.09% oleic, 34.71% linoleic, 0.11% ∝-linoleic and 3.23% other fatty acids (product from Imex Co.). Calf starter and berseem hay were offered for each calf in all tested groups *ad lib.* from the 2nd week of age. Calf starter[1] (unsupplemented with 10% soybean meal) was offered for $G_1$, while calf starter[2] was supplemented with 10% soybean meal to increase its protein content was used for feeding calves in $G_2$, $G_3$ and $G_4$. Chemical composition of buffalo and cow's milk (fat, protein, total solids and solids not fat) was estimated by a Milko Scan, Model 133B.

Chemical composition of the different feedstuffs, buffalo and cow's milk are presented in Tables 2 & 3. Calves were weighed at birthday, then weekly till the weaning time (105 days) to calculate the growth rate. Moreover, both feed conversion and economical efficiency were calculated for the different tested groups as following: Feed conversion = amount of feed consumed (expressed as DM, TDN, DE and DCP)/ kg LBW gain. However, Economical efficiency = price of LBW gain, LE / price of feed consumed (LE/ kg gain). It was estimated on the basis of the follow prices (LE/kg): LBW gain (14.00), buffalo s milk (2.00), cow s milk (1.30), calf starter (1.30), fat powder (2.80), soybean meal (1.80) and berseem hay (0.65). Four digestibility trials were conducted using 3 male buffalo calves chosen randomly from each group at 12 weeks of age using metabolic cages to determine the nutritive values (expressed as TDN, DE and DCP) of the tested rations. Digestible energy (DE) was calculated according to the following equation: DE = TDN% x 0.04409 (NRC, 1988).

Rumen liquor samples were taken at the end of 15th week of suckling period from 3 calves in each group at 3 hrs after the morning feeding using a rubber stomach tube and filtered through double layers of cheesecloth. Rumen liquor pH value was determined directly using digital pH meter. Thereafter, samples were stored in dry clean glass bottles with addition of few drops of saturated mercuric chloride solution to stop the microbial activity and were kept in deep freezer until analysis. Total volatile fatty acids (VFA's) concentration was determined by the steam distillation method using Markham micro-distillation apparatus

(Warner, 1964). However, $NH_3$-N concentration was determined using saturated solution of magnesium oxide distillation according to the method of A.O.A.C. (1990). Blood samples were taken from 3 calves at the end of digestibility trials. Blood was withdrawn from the jugular vein in dry clean glass tubes using heparin as anticoagulant and then centrifuged for 15 minutes at 4000 rpm to obtain plasma. Total proteins. albumin, cholesterol, total lipids, urea, creatinine, activity of aspartate transferase (AST) and alanine amino transferase (ALT) of plasma were determined according to the methods described by Varley (1976). While, globulin concentration was obtained by subtracting the albumin form the total plasma proteins concentration.

Data were statistically analyzed using General Linear Models Procedure (one way ANOVA model) adapted by SPSS (1997). while appropriate means were separated using Duncan's multiple range test.

## RESULTS AND DISCUSSION

### *1- Chemical composition*

As shown in Table 2 results indicated that. adding fat powder to cow's milk used for feeding buffalo calves in $G_2$, $G_3$ and $G_4$ during suckling period lead to increase the most of nutrient contents especially TS and fat. These results are in accordance with those reported by Hegazi *et al.* (2005), who found that adding inert fat to commercial milk replacer used in rearing buffalo calves lead to increase its fat content. Moreover, composition of cow s milk supplemented with 3% fat powder tended to be nearly similar to buffalo's milk. All nutrient contents of milk mixtures were used for feeding buffalo calves in both of $G_2$ and $G_3$ increased with increasing the proportion of buffalo's milk from 25 to 50%. However, results in Table 3 indicated that. adding 10% of soybean meal to calf starter increased its protein content from 17.8 to 19.7%. which lead to more protein consumed by calves in $G_2$. $G_3$ and $G_4$. Generally. chemical composition of buffalo's milk was nearly similar with those obtained by many workers (El-Ashry *et al.*. 2003: Rashed. 2004 and Hegazi *et al.*, 2005).

**Table (2): Chemical composition of buffalo and cow's milk used in suckling buffalo calves.**

| Items* | Milk composition, % | | | | | |
|---|---|---|---|---|---|---|
| | TS | Protein | Fat | Lactose | SNF | Ash |
| **Buffalo and cow's milk composition (Fresh)** | | | | | | |
| 100%BM ($G_1$) | 17.20 | 3.94 | 6.91 | 5.48 | 10.29 | 0.87 |
| 50%BM+50%CM ($G_2$) | 16.18 | 3.43 | 6.57 | 5.34 | 9.61 | 0.84 |
| 25%BM+75%CM ($G_3$) | 15.67 | 3.18 | 6.40 | 5.27 | 9.27 | 0.82 |
| 100%CM ($G_4$) | 15.15 | 2.92 | 6.23 | 5.20 | 8.92 | 0.80 |
| **Buffalo and cow's milk composition (calculated, on DM basis)** | | | | | | |
| 100%BM ($G_1$) | 100 | 22.91 | 40.17 | 31.86 | 59.83 | 5.06 |
| 50%BM+50%CM ($G_2$) | 100 | 21.20 | 40.61 | 33.00 | 59.39 | 5.19 |
| 25%BM+75%CM ($G_3$) | 100 | 20.29 | 40.84 | 33.63 | 59.16 | 5.24 |
| 100%CM ($G_4$) | 100 | 19.27 | 41.12 | 34.32 | 58.88 | 5.29 |

*Cow's milk used in $G_2$, $G_3$ and $G_4$ was supplemented with 3% fat powder. $G_1$: 100% whole buffalo's milk, $G_2$: Milk mixture contained 50% buffalo's milk +50% cow's milk, $G_3$: Milk mixture contained 25% buffalo's milk + 75% cow's milk, $G_4$: 100% whole cow's milk.

**Table (3): Chemical composition of ingredients used in feeding buffalo calves.**

| Items | DM,% | DM composition, % | | | | | |
|---|---|---|---|---|---|---|---|
| | | OM | CP | EE | CF | NFE | Ash |
| Calf starter[1]* | 91.45 | 90.93 | 17.82 | 3.25 | 6.02 | 63.84 | 9.07 |
| Calf starter[2] | 91.75 | 91.60 | 19.75 | 3.65 | 5.83 | 62.37 | 8.40 |
| Soybean meal | 90.45 | 94.69 | 39.62 | 2.98 | 11.09 | 41.00 | 5.31 |
| Fat powder | 84.97 | 98.87 | 6.25 | 88.90 | - | 3.72 | 1.13 |
| Berseem hay | 89.05 | 91.85 | 12.20 | 2.35 | 27.50 | 49.80 | 8.15 |

*Calf starter[1]: Unsupplemented with 10% soybean meal was used in feeding $G_1$. It consisted of 15% soybean meal, 10% linseed cake, 34% ground corn grain, 20% wheat bran, 15% rice bran, 3% molasses, 2% limestone and 1% common salt.
Calf starter[2]: supplemented with 10% soybean meal was used in $G_2$, $G_3$ and $G_4$.

*2- Digestibility and nutritive values*

As presented in Table 4, no significant differences were observed among the different tested rations in digestion coefficients for all nutrients and nutritive values. Values of TDN, DE and DCP for different rations were ranged from 80.7-82.0%, 3.6 Mcal/kg DM and 14.3-15.0%, respectively. These values are in agreement with those recorded by Helal *et al.* (1999) with suckling buffalo calves. While, these values were somewhat lower than those obtained by Mohy El-Deen (1989), when buffalo calves were fed rations contained whole buffalo's milk, calf starter and berseem hay. However, the reported values were higher than

those recorded by Gaafar *et al.* (2004), when Friesian calves were fed cow's milk, calf starter and berseem hay. The differences between the digestion coefficient and nutritive values obtained in the current study and the previous mentioned studies may be attributed to the kind of suckling milk, quantity and quality of calf starter and roughage type.

***3- Fermentation in the rumen***

Results of fermentation in the rumen are shown in Table 4. The highest ($P<0.05$) pH value was observed in $G_4$ when calves were suckled 100% cow s milk, while no significant differences were detected among the other groups. It was noticed that, the average of pH values was ranged between 6.0 and 6.2 for the different experimental groups. These values indicate that, no deleterious effect on digestion of roughage's in all tested groups. Mehrez *et al.* (1983) and Van Soest (1983) reported that, the activity of cellulytic bacteria during ruminal fermentation might be inhibited when pH value of rumen liquor is out of the normal range (below from 6 to 6.7). The lowest ($P< 0.05$) VFA's values were reported for $G_4$. while no significant differences were observed among the other groups. The present results are in accordance with those obtained by Saleh (2003) with suckling buffalo calves and Gaafar (2001) with suckling Friesian calves. However. no significant differences were found for $NH_3$-N concentration among all tested groups. This may be due to the calves in all groups consumed nearly similar amount of digestible crude protein (DCP) as shown in Table 5. These results are in harmony with those obtained by Gaafar (2001). Mean ruminal ammonia-N concentration in the present study for all tested groups were in the normal range as reported by Church (1976).

***4- Blood constituents***

Results of blood plasma constituents are presented in Table, 4. Total plasma proteins, albumin and total lipids concentrations were significantly ($P<0.05$) differed, while no significant differences were found for globulin, cholesterol, urea, creatinine, AST and ALT concentrations among the tested groups. Generally, the present results were fluctuated and within the normal range of blood parameters for healthy suckling buffalo calves as reported recently by many investigators (Yossef, 1992; Abd El-Aal.. 2000; El-Ashry *et al.*, 2003 and Hegazi *et al.*, 2005). who recorded that blood plasma contain total proteins, albumin and globulin ranged from 6.3-7.3, 2.3-3.9 and 2.8-3.7 g/dl, respectively. However, the current results were higher than those reported by El-Ashry *et al.* (2002).

**Table (4): Digestibility, nutritive values, rumen liquor parameters and blood constituents of buffalo calves during suckling period.**

| Items | Tested groups | | | | ±SE |
|---|---|---|---|---|---|
| | $G_1$ | $G_2$ | $G_3$ | $G_4$ | |
| **Digestibility, %** | | | | | |
| DM | 73.57 | 71.69 | 73.16 | 72.93 | 0.93 |
| OM | 76.87 | 75.72 | 76.96 | 76.83 | 0.78 |
| CP | 82.31 | 81.61 | 82.15 | 82.12 | 0.68 |
| CF | 55.64 | 50.82 | 59.96 | 55.21 | 1.55 |
| EE | 90.36 | 90.16 | 90.45 | 89.99 | 0.27 |
| NFE | 76.62 | 75.60 | 76.58 | 76.62 | 0.81 |
| **Nutritive values** | | | | | |
| TDN, % | 81.05 | 80.74 | 82.05 | 82.00 | 0.76 |
| DE, Mcal/kg DM | 3.57 | 3.56 | 3.62 | 3.62 | 0.03 |
| DCP, % | 14.35 | 15.00 | 15.05 | 14.94 | 0.15 |
| **Rumen liquor parameters** | | | | | |
| pH | $6.02^b$ | $6.04^b$ | $6.04^b$ | $6.23^a$ | 0.05 |
| VFA's, mEq/ dl | $9.69^a$ | $9.76^a$ | $9.88^a$ | $9.17^b$ | 0.08 |
| $NH_3$-N, mg/ dl | 11.85 | 11.81 | 11.98 | 11.55 | 0.12 |
| **Blood constituents** | | | | | |
| Total proteins, g/dl | $6.53^b$ | $6.50^b$ | 6.56 | $7.44^a$ | 0.14 |
| Albumin, g/dl | $3.32^b$ | $3.27^b$ | $3.41^b$ | $3.86^a$ | 0.09 |
| Globulin, g/dl | 3.21 | 3.23 | 3.15 | 3.58 | 0.07 |
| Total lipids, g/dl | $1.78^b$ | $1.87^b$ | $1.93^b$ | $2.28^a$ | 0.06 |
| Cholesterol, mg/dl | 60.27 | 60.39 | 60.06 | 60.34 | 0.11 |
| Urea, mg/dl | 49.51 | 49.00 | 48.81 | 49.00 | 0.17 |
| Createnine, mg/dl | 1.83 | 1.90 | 1.89 | 1.91 | 0.01 |
| AST. IU/L | 31.73 | 31.38 | 32.08 | 31.69 | 0.24 |
| ALT. IU/L | 21.46 | 22.58 | 21.66 | 22.28 | 0.18 |

a and b: Mean in the same row with different superscripts differ significantly (P< 0.05).

*5- Growth rate, feed conversion and economical efficiency*

Data presented in Table 5 showed that. the higher (P<0.05) values of both TDN and DE intake were obtained for buffalo calves suckled 75 and 100% cow's milk in both $G_3$ and $G_4$. respectively compared to the other tested groups. However. no significant differences were observed among the experimental groups in both DM and DCP intake. The mean DCP intake by calves in all different groups was nearly similar. being 0.23 - 0.24 kg/head/day. These may be due to adding 10% soybean meal

to cow's milk which was used in feeding $G_2$, $G_3$ and $G_4$, this lead to increase protein intake for these groups. In the present study, values of DM, TDN, DE and DCP intake are in harmony with those reported by Abd El-Aal (2000) and Hegazi *et al.* (2005) with suckling buffalo calves.

No significant differences were observed among the tested groups for initial LBW of buffalo calves (Table 5). However, the averages total and daily LBW gain were significantly ($P<0.05$) higher for $G_1$ than other tested groups. These results are in accordance with those recorded by Helal (1985), El-Ashry *et al* (1988) and Hegazi *et al.* (2005), who reported that daily gain was ranged between 593 and 793 g/h/day for suckling buffalo calves. Otherwise, the present values were higher than those obtained by many investigators (El-Basiony, 1983; Mohy El-Deen, 1989; Yossef, 1992 and Helal *et al.*, 1999), who reported that, the average of daily gain was ranged between 285 and 573 g/h/day for buffalo calves under different rearing systems. The current results indicated that, increasing buffalo's milk proportion in suckling milk mixture lead to increase ($P<0.05$) both total and daily LBW gain that may be attributed to the comparatively higher digestible nutrients intake (Table 5).

Results of feed conversion efficiency (Table 5) indicated that, calves suckled 100% whole buffalo's milk in $G_1$ consumed less amount of DM to produce one-kg gain compared to the other groups. This may be due to the superior of $G_1$ in growth rate comparing with the other tested groups. However, very close values were obtained with $G_2$, $G_3$ and $G_4$ that were suckled 50, 75 and 100 % cow's milk. The differences among all experimental groups were insignificant. Generally, feed conversion efficiency was decreased with gradually increasing cow's milk proportion in milk mixture. In the present study, the overall values of DMI/kg gain were lower than those obtained by many workers (Helal, 1985; El-Ashry *et al.*, 2003 and Abd El-Aal, 2000), who found that, values were ranged between 2.45 and 3.20 kg DMI/kg gain for suckling buffalo calves. This may be due to the different rearing systems and amount of suckled milk along with feeding different quality and quantities of both milk replacers and calf starters. Moreover, values of feed conversion efficiency expressed as TDN, DE and DCP showed almost the same trend of DM values. Generally, all tested groups had nearly similar nutritive values termed as TDN, DE and DCP (Table 4). Furthermore, feed conversion efficiency for all nutrients was nearly similar and the differences among different groups were insignificant (Table 5).

**Table (5): Effect of rearing systems on feed intake, daily gain, feed conversion and economical efficiency of buffalo calves during suckling period.**

| Items | Tested groups | | | | ±SE |
|---|---|---|---|---|---|
| | $G_1$ | $G_2$ | $G_3$ | $G_4$ | |
| Duration, day | 105 | 105 | 105 | 105 | |
| **Daily feed intake*** | | | | | |
| Buffalo milk (fresh, kg) | 3.64 | 1.91 | 1.05 | 0.18 | - |
| Cow's milk (fresh, kg) | - | 1.73 | 2.59 | 3.47 | - |
| Fat powder (as fed, kg) | - | 0.05 | 0.08 | 0.10 | - |
| Calf starter[1] (as fed, kg) | 0.77 | - | - | - | - |
| Calf starter[2] (as fed, kg) | - | 0.77 | 0.77 | 0.77 | - |
| Berseem hay (as fed, kg) | 0.32 | 0.32 | 0.32 | 0.32 | - |
| DM intake, kg | 1.62 | 1.61 | 1.62 | 1.62 | 0.03 |
| TDN intake, kg | 1.31 [b] | 1.30 [b] | 1.33 [a] | 1.33 [a] | 0.01 |
| DE intake, Mcal | 5.78 [b] | 5.73 [c] | 5.86 [a] | 5.86 [a] | 0.01 |
| DCP intake, kg | 0.23 | 0.24 | 0.24 | 0.24 | 0.01 |
| **Body weight and daily gain, kg** | | | | | |
| Birth weight | 40.37 | 40.62 | 40.75 | 40.62 | 0.56 |
| Body weight at 105 day | 116.21 | 111.62 | 112.00 | 111.00 | 1.07 |
| Total weight gain | 75.84 [a] | 71.00 [b] | 71.25 [b] | 70.38 [b] | 0.75 |
| Daily weight gain | 0.72 [a] | 0.68 [b] | 0.68 [b] | 0.67 [b] | 0.01 |
| **Feed conversion efficiency** | | | | | |
| DM, Kg/ kg gain | 2.25 | 2.37 | 2.38 | 2.42 | 0.02 |
| TDN, Kg/ kg gain | 1.82 | 1.91 | 1.96 | 1.98 | 0.02 |
| DE, Mcal/ kg gain | 8.03 | 8.43 | 8.62 | 8.75 | 0.09 |
| DCP, Kg/ kg gain | 0.32 | 0.35 | 0.35 | 0.36 | 0.01 |
| **Economical efficiency** | | | | | |
| Price of daily gain, LE | 10.08 [a] | 9.52 [a] | 9.52 [b] | 9.38 [b] | 0.08 |
| Feed cost, LE/ day | 8.50 [a] | 7.45 [b] | 6.93 [c] | 6.40 [c] | 0.14 |
| Feed cost, LE/ kg gain | 11.81 [a] | 10.96 [b] | 10.19 [c] | 9.55 [c] | 0.20 |
| Economical efficiency | 1.19 [a] | 1.28 [b] | 1.37 [c] | 1.47 [d] | 0.02 |

a, b, c and d: Mean in the same row with different superscripts differs significantly ($P < 0.05$). * Daily feed intake was calculated based on 102 days excluding 3 days as colosterum suckling period.

Data of feed cost and economical efficiency are shown in Table 5. Feed cost declined by 7.2, 13.7 and 19.1 % and economical efficiency improved by 7.6, 15.1 and 23.5 %, respectively for calves suckled 50, 75

and 100 % cow's milk in $G_2$, $G_3$ and $G_4$, respectively compared to those given 100 % buffalo's milk in control group ($G_1$). The decrease of feed cost and increase of economical efficiency was recorded with gradually increasing cow's milk portion in milk mixture. This mainly due to the lower price of cow's milk than buffalo's milk. Mohy El-Deen (1989) indicted that, using milk replacer for buffalo calves reduced the feed cost by 19.2-31.9% compared to those given buffalo milk only.

The nutritional, economical and clinical observations of the present study encourage substituting buffalo's milk with cow's milk in suckling newly born buffalo calves to decrease feed cost, which lead to increase economical efficiency. As well as, saving buffalo's milk for human consumption or sell it due to its high price, however the gross margin increased with such rearing regime. Moreover, no healthy troubles or bad effects were observed on the performance of calves during suckling period.

## REFERENCES

Abd El-Aal, S. A. E. (2000). Nutritional studies on raising suckling calves. Ph.D. Thesis, Ain Shams Univ., Fac. of Agric.

A.O.A.C. (1990). Association of Official Analytical Chemists Official Methods of Analysis. 15th Ed., Washington DC.

APRI (1997). Animal Production Research Institute, Animal Nutrition Scientifically and Practically. 1st Ed. Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture.

Church, D. C. (1976). Digestive Physiology and Nutrition of Ruminants. Vol. 1- Digestive Physiology. 2nd Ed. 8 B Books, Corvallies, Oregan.

El-Ashry, M. A.; A. M. El-Serafy; A. A. Zaki and H. Soliman (1988). Plant Proteins in milk replacers for rearing buffalo caves. 1- Effect of replacing half of the milk proteins by plant proteins on the pre-weaning performance of buffalo calves. Beltrage trop. Landwirtsch. Veterinarmed. 26, H. 1: 55.

El-Ashry, M.A; Salwa M. Hamdy; A.M. Mansour; M.M. Khorshed and E.M. El-Kotamy (2003). Studies on performance of buffalo calves fed on acidified milk. Egyptian j. Nutr. and feeds. 6: 1.

El-Ashry, M.A; Zeba A. Motagaly and Y. A. Maareek (2002). Effect of live dried baker s yeast with or without acidification of milk and of yeast culture on performance of suckling buffalo calves. Egyptian j. Nutr. and feeds. 5: 31.

El-Basiony, A. Z. (1983). Productive performance of artificially reared calves. Ph. D. Thesis, Fac. of Agric., Ain Shams Univ.

FAO (1998). Food and Agriculture Organization of United Nations. Production yearbook, Vol. 52, FAO Publ., Rome. Italy, P 35.

Gaafr, H. M. A. (2001). Performance of growing calves fed rations containing corn silage. Ph.D. Thesis, Fac. of Agric. Kafr El-Sheikh Tanta Univ.

Gaafar, H. M. A.; A. A. Shitta and S. A. Ibrahim (2004). Some factors affecting the productive performance of suckling Friesian calves. Egyptian J. Basic and Appl. Physiol., 3: 273.

Hegazi, S. M.; Bakr, A. A.; Agag, B. I. and Mousa, M. A. (2005). Influence of fat increment in milk replacer on performance of buffalo calves. Egyptian j. Nutr. and feeds, 8 (Special Issue): 253.

Helal, F. I. S. (1985). The effect of energy density and source in milk replacers on the productive performance of buffalo calves. Ph.D. Fac. of Agric. Ain Shams Univ.

Helal, F.I.S.; M. A. El-Ashry; H.S. Soliman and H.M. Aly (1999). Newly born buffalo calves receiving milk replacers containing different sources and levels of energy density. 2- Effect of incorporating high levels of homogenized margarine in local milk replacers for rearing young buffalo calves. Egyptian j. Nutr. and feeds, 2 (Special Issue): 459.

Mehrez, A. Z.; M. M. El-Shinnawy; M. M. El-Ashry and H. M. El-Sad (1983). Assessment of associative effects of roughage and concentrates. Diamond Jubilee of Amer. Soc. Anim. Sci. Pullman. Washington State Univ.

Mohy El-Deen, M. M. (1989). Effect of milk replacers on the performance of buffalo calves. Ph.D. Thesis, Fac. of Agric. Tanta Univ., Egypt.

Nigm, A.A. (1996). Characterization of the Egyptian buffalo International Symposium on Buffalo Resource and Production Systems, Anim. Prod. Res. Inst. Cairo, Egypt 14-17 Oct. 1.

NRC (1988). Nutrient Requirement of Dairy Cattle. 6th Ed. National Academy Press, Washington, D.C., USA.

Rashed, H. E. R. (2004). Nutritional studies on buffaloes. Msc. Thesis. Fac. of Agric. Kafr El-Sheikh. Tanta Univ.

Saleh, M. S. (2003). Effect of rotating lasalocid and monensin plus tylosin on performance of suckling buffalo calves. J. Agric. Res. Tanta Univ., 29(1): 8.

SPSS (1997). SPSS Basic 7.5 for Windows, User's Guide, SPSS Inc.
Van Soest, P.J. (1983). Nutritional ecology of the ruminant. Covallis, Oregon, O. and B. Books.
Varley, H., (1976). Practical Clinical Biochemistry. 4th Ed, New Delhi, India.
Warner, A.C.I. (1964). Production of volatile fatty acids in the rumen, method of measurements. Nutr. Abst. and Rev., 34: 339.
Yossef, M. M. M. (1992). Growth pattern of buffalo calves in relation to rumen development and growth promoters treatment. Ph.D. Thesis. Fac. of Agric. Cairo Univ.

## الملخص العربى

## تنشئة العجول الجاموس على اللبن البقرى

**محمد سعيد صالح[١]، محمود محمد بندارى[٢]، قطب فتح الباب الريدى[٢]**

١- قسم الإنتاج الحيواني- كلية الزراعة - جامعة كفر الشيخ- مصر.
٢- معهد بحوث الإنتاج الحيوانى- مركز البحوث الزراعية- وزارة الزراعة.

استخدم في هذه الدراسة ٣٢ عجل وعجلة جاموس حديثى الولادة وزعت عشوائيا على أربع مجموعات متماثلة لدراسة تأثير إحلال اللبن البقرى محل اللبن الجاموسى على أداء العجول الجاموس خلال فترة الرضاعة حتى عمر الفطام (من عمر اسبوع حتى عمر ١٠٥ يوم). غذيت العجول في المجموعة الأولى (مجموعة المقارنة، ج١) على ١٠٠% لبن جاموسي كامل بينما غذيت العجول في المجموعة الثانية (ج٢) على لبن مخلوط يحتوى على ٥٠ % لبن جاموسي+ ٥٠% لبن بقرى، و في المجموعة الثالثة (ج٣) غذيت العجول على لبن مخلوط يحتوى على ٢٥% لبن جاموسي+ ٧٥% لبن بقرى، أما المجموعة الرابعة (ج٤) فغذيت فيها العجول على ١٠٠% لبن بقرى كامل. أضيف إلى اللبن البقرى أثناء الرضاعة ٣% مسحوق دهن، كما أضيف ١٠% كسب فول صويا إلى البادئ المستخدم في تغذية العجول في المجموعات الثانية والثالثة والرابعة.

و كانت النتائج المتحصل عليها كالآتى :-

١- تراوحت القيمة الغذائية للعلائق كمجموع مركبات غذائية مهضومة من ٨٠,٧-٨٢,٠٥% و طاقة مهضومة٣,٦ ميجا كالورى/كجم مادة جافة و بروتين مهضوم من ١٤,٣-١٥,٠% بدون فروق معنوية بين المجموعات التجريبية المختلفة.

٢- كانت قيم رقم الحموضة والأحماض الدهنية الطيارة الكلية وتركيز نيتروجين الأمونيا بسائل الكرش وأيضا مكونات بلازما الدم للعجول في كل المجموعات في الحدود الطبيعية لعجول الجاموس الرضيعة.

٣- حققت المجموعة الأولى (ج١) والتي غذيت على اللبن الجاموسى الكامل أكبر معدل نمو (٠,٧٢كجم/يوم) تلتها المجموعة الثانية و الثالثة (٠,٦٨ كجم) أما المجموعة الرابعة فقد سجلت أقل معدل نمو (٠,٦٧كجم) ولم تلاحظ فروق معنوية بين المجموعات ج٢، ج٣، ج٤.

٤- أدى انخفاض سعر اللبن البقرى إلى انخفاض تكلفة الغذاء اللازم لإنتاج كجم نمو بنسبة ٧,٢، ١٣,٧، ١٩,١% كما أدى إلى تحسن الكفاءة الاقتصادية بنسبة ٧,٦، ١٥,١، ٢٣,٥% في المجموعة الثانية والثالثة والرابعة على التوالي و المغذاة على مستويات مختلفة من اللبن البقرى مقارنة بالمجموعة الأولى التي غذيت على اللبن الجاموسى الكامل.

٥- لم يلاحظ أثناء إجراء التجربة وجود أي مشاكل صحية أو تأثيرات سلبية على الأداء الإنتاجي للعجول نتيجة استخدام اللبن البقرى فى الرضاعة و كانت العجول ذو حيوية عالية ولم تسجل أي حالات نفوق خلال فترة التجربة.

من نتائج هذه الدراسة يمكن أن ننصح المربيين بتنشئة عجول الجاموس على اللبن البقرى منخفض الثمن بدلا من اللبن الجاموسى المرتفع الثمن و ذلك لتقليل تكاليف التغذية بالإضافة إلى الاحتفاظ بتلك العجول بدلا من ذبحها حفاظا على الثروة الحيوانية.