Productive Performance of Buffalo Calves Fed Rations Supplemented with Folic Acid

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ABSTRACT

To investigate the impact of folic acid (FA) supplementation on growth performance and nutrient digestion in growing male buffalo calves, fifteen buffalo calves were randomly divided into three groups (five animals/group). The average initial live body weight of the buffalo calves was 181 ± 0.2 kg. Three nutritional groups of calves were randomly assigned to receive one of the three experimental rations; the control group (T_1) was fed the basal diet; the second group (T_2) was fed the control ration plus 50 mg of folic acid per head /day, and the third group (T_3) was fed the control ration plus 75 mg of folic acid per head /day. Daily gain recorded by T_2 was (0.77 kg/h/d) somewhat higher than T_1 (0.75 kg/h/d) followed by T_3 (0.85 kg/h/d). The daily gain of calves that received rations of folic acid 75 mg/h/day was slightly higher than that of calves that received rations without folic acid supplementation (control group). The total dry matter intake and feed conversion ratio were not significantly affected by folic acid administration. The digestibility coefficients for DM, OM, CP and CF of T_3 were significantly greater than those of T_1 (control group), but there was no statistically significant difference between T_1 and T_2 or T_2 and T_3. The third treatment recorded highest value for protein digestibility coefficients, while the first treatment recorded lowest value, and the differences were statistically non-significant. The supplementation of FA to buffalo calves' rations significantly improved the amount of total digestible nutrients and digestible crude protein.

Keywords: Folic acid; productive performance; buffalo calves.

INTRODUCTION

Folic acid plays an important role in cell division and animal development and is needed for the synthesis of RNA and DNA (Girard and Matte 1997 and Kahraman *et al.*, 2015). The primary function of folic acid is to provide or accept a carbon unit in the metabolism of amino acids, purine and pyrimidine synthesis, and the formation of the primary methylating agent, S-adenosyl methionine (SAM), the ingested FA is firstly condensed to dihydrofolic, then to tetrahydrofolate, which accepts a methyl group to produce 5- methyl tetrahydrofolate (Bailey and Gregory, 1999). Early *in vitro* studies reported that supplementation with folic acid increased the digestion of cellulose (Hall *et al.*, 1953) and that Ruminococcus flavefaciens growth needed tetrahydrofolate (THF) or 5-methyl-THF (Slyter and Weaver 1977). Moreover, studies demonstrated that folic acid increased the digestibility of nutrients and volatile fatty acids in the rumen with an increase in rumen bacteria in calves (Liu *et al.*, 2020). Folic acid supplementation improved the digestibility of acidic detergent fibers (Ragaller *et al.*, 2010) and ammonia utilization *in vitro* (Wejdemar, 1996). Various investigations revealed that the digestion of nutrients, rumen fermentation, and the microbial protein synthesis were not affected by the addition of folic acid to the diets (Yongjia *et al.*, 2022). This variation in the results can be attributed to the difference in the level of folic acid that was studied. Thus, the purpose of this study was to investigate more different levels of folic acid (FA) supplementation in diets and its effects on the performance and nutrient digestion of growing male buffaloes.

MATERIALS AND METHODS

This study was conducted from February to September 2021 (83 days) at Mostorod Research and Experimental Station belongs to the Faculty of Agriculture, Al-Azhar University, Mostorod, Qalyubia Governorate. All animals were fed on a basal diet (15.2 % CP), according to NRC recommendation (NRC 1981). The basal ration was composed of concentrate feed mixture (CFM) and wheat straw (65:35%, respectively). The concentrated feed mixture contained: yellow corn, decorticated cotton seed meal, wheat bran, molasses, limestone and salt. Chemical composition of CFM and wheat straw is presented in Table (1).

Fifteen male buffalo calves with an initial live body weight of 181 kg ± 0.2 were randomly divided into three groups (each of five animals/group). The groups were fed experimental diets as follows; the first group was fed on a basal diet and served as a control (T_1); the second group (T_2) was fed on the control ration plus 50 mg folic acid /head/day (T_2) and the third group fed on the control ration plus 75 mg folic acid /head/day (T_3).

Rations were freely given to the animals, and the feed provided, and leftovers were weighed and recorded daily. Ration samples were provided, and any leftovers were weighed daily during the collection period for further chemical analysis. Samples of feeds and faeces were analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash contents according to A.O.A.C. (1990).

Statistical analysis

Data were subjected to statistical analysis using one-way analysis of variance (ANOVA), using the general linear Models procedure of SPSS version 27.0 (SPSS, IBM, Inc., Chicago, USA). Differences between means were tested for significances using the L.S.D test, according to Duncan (1955). Analysis of variance and least square means was carried out using the following equation:

$Y_{ij} = \mu + T_i + \varepsilon_{ij}$ Where:

Y_{ij}= the observation of the parameter measured,

μ= overall means,

T_i= the effect of dietary treatment and

ε_{ij} = the random error term.

RESULTS AND DISCUSSION

The impact of folic acid supplementation in diet on the performance of buffalo calves.

Average daily gain:

Data presented in Table (2) showed the impact of folic acid levels on daily gain over 150 days. The obtained results indicated significant differences among various treatments in daily gain. The daily gain recorded by T_2 was (0.77 kg/h/d) which slightly higher than T_1 (0.75 kg/h/d) followed by T_3 (0.85 kg/h/d) . The daily gain for calves that received a ration containing 75mg/h/d folic acid was greater (P<.05) than those calves that received a control ration (without folic acid). However, the differences between calves that received a ration with 50mg/h/d (T_2) and those that received a ration with 75mg/h/d (T_3) were not significant. Also, there were no significant differences between the control group (T_1) and the group of T_2.

The increase in average daily gain observed in this study may be attributed to an increase in nutrient digestibility (Table 3), which shows that folic acid supplementation improves feed utilization in calves as seen by an increased feed conversion rate. Similar results were obtained in other studies that examined the effects of folic acid supplementation on weight gain in dairy calves (Dumoulin *et al.,* 1991; Petitclerc *et al.,* 1999).

Daily gain detected is consistent with folic acid's beneficial effects on protein synthesis metabolism in calves, which are explained by the contribution of folic acid in this process (Bailey and Gregory, 1999). Furthermore, supplementation of folic acid to calves' rations increased the expression of genes involved in protein synthesis (La *et al.,* 2019). In other research by (Dumoulin *et al.,* 1991; Wang *et al.,* 2019), it was revealed that folic acid supplementation, either parenterally or through food, improved the calves' daily growth rate.

Feed intake and feed conversion ratio:

Table (2) shows the total amount of dry matter intake during the trial period as kg/h/d. Total dry matter intake (DMI) as affected by supplementation of folic acid were 8.88, 8.79 and 8.85 for groups of buffalo calves fed on control and the tested rations with 50 or 75 mg/h/d, respectively.

Feed intake as TDN was 5.75, 0.59 and 4.38, while DCP was 0.45 and 4.51and 0.46 for treatments T_1, T_2 and T_3, respectively. These results indicated that DM intake was not affected by supplementation of folic acid, while the group fed on the control ration consumed feed slightly higher than the other treatments and the differences among treatments were few. In the same line with earlier studies (Graulet *et al.,* 2007), folic acid supplementation had no marked impact on DMI in steer (Wang *et al.,* 2016), Angus bulls (Wang *et al.,* 2020), or dairy calves (La *et al.,* 2019). Dry matter intake was not affected by the addition of FA in dairy cows, indicating that folic acid supplementation had no significant impact on DMI. However, according to other research, FA supplementation improved DM intake in transition dairy cows (Evans *et al.,* 2006) and in weaned dairy calves (Wang *et al.,* 2019).

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Figured in Table (2) illustrate the effect of folic acid supplementation on feed conversion measured as kg DM, kg TDN, or kg DCP /kg gain. Feed conversion ratios as kg DM/kg gain were 11.84, 8.64 and 7.82, as kg TDN/kg gain were 7.57, 5.70 and 5.31 and as kg DCP/ kg gain were 0.79, 0.59 and 0.54 for T_1, T_2 and T_3, respectively. Feed conversion recorded by the group that received 75mg FA/animal/day was the highest, whereas, recorded by the group that received the control ration (without folic acid) was the lowest. Improvement in feed conversion for groups that received folic acid (T_2 and T_3) may be due to improvement in nutrients digestibility of these groups.

The results of the current study are consistent with those obtained in weaned dairy calves (Wang *et al.,* 2019), in dairy cows (Cheng *et al.,* 2020) and in dairy calves (Zhang *et al.,* 2020).

Folic acid (FA) plays a significant role in the synthesis of protein and DNA by enabling the transfer of one-carbon units, which may explain the improvement in feed conversion in T_2 and T_3 (Bailey and Gregory 1999). According to Ratriyanto *et al.,* (2009), the 5methyl tetrahydrofolate transfers the situation methyl group to homocysteine to produce methionine, the 5,10 methylene-THF contributes its CH_2 unit to the synthesis of thymidylate, and the 10 formyl-THF is utilized in the de novo synthesis of purine. According to various studies, the stimulating effect of folic acid on DNA synthesis in dairy cows was related to an increase in milk protein yield with folic acid addition (Graulet *et al.,* 2007), and an up-regulated gene expression of the mammalian target of rapamycin signing pathway in the liver of dairy calves was linked to an improvement in growth performance following rumen-protected folic acid supplementation (La *et al.,* 2019).

Supplemental folic acid and its effect on the coefficient of digestibility and nutritive value.

The results presented in Table (3) demonstrated how folic acid supplementation influenced the apparent digestibility coefficients of nutrients and nutritive values. Digestibility coefficients of DM, OM, and CF were 65.02, 69.11, and 60.23; 66.87, 70.84, and 62.83 and 69.06, 72.33, and 63.77 % for T_1, T_2, and T_3, respectively. The coefficients of digestibility of DM, OM, and CF from T_3 were significantly higher than those from T_1 (control), nevertheless, there was no statistically significant difference between T_1 and T_2 or T_2 and T_3.

The improvement in DM and OM digestibility was in agreement with the results reported by Wang *et al.,* (2019), Liu *et al.,* (2020), and Yongjia *et al.,* (2022) in calves, suggesting that folic acid improves nutrient digestion in both the rumen and post rumen. Folic acid supplementation may have an effect on the nutritional breakdown in the rumen because of the increase in apparent total tract digestibility of DM and OM. Additionally, pancreas cells' ability to develop and secrete digestive juices depends on folic acid (Longnecker, 2002). *In vitro* studies conducted by Parnian-Khajehdizaj *et al.,* (2018) showed that folic acid supplementation improved post-ruminal and total tract DM digestibility. With the addition of rumen-protected folic acid in steers, Wang *et al.,* (2016) found that the ruminal degradability of DM, OM, and NDF was improved.

Protein digestibility coefficients (Table, 3) as affected by supplementation of folic acid were 60.42, 62.57 and 63.06 % for T_1 (ration without folic acid), T_2 (50mg FA/h/d) and T_3 (75mg FA/h/d), respectively. Differences among all treatments were significant ($P>0.05$), the third treatment recorded the highest value for protein digestibility coefficients, while the first treatment recorded the lowest value.The improvement in the apparent digestibility of crude protein was primarily attributed to the activity of ruminal enzymes and microbial protein synthesis, revealing that feed protein utilization enhanced with increasing folic acid supplementation as demonstrated by the increase in average daily gain. Because the digestibility of microbial protein in the gastrointestinal tract is rather constant (0.80), whereas that of feed protein varied from 0.5 to 1.0 according to the feed source (NRC 2001; Liu *et al.,* 2008), a higher CP digestibility may ascend from an improved flow of microbial protein to the intestine.

The effects of folic acid supplementation on digestible crude protein (DCP) and total digestible nutrient (TDN) of the experimental rations were shown in Table (3).

The total digestible nutrient (TDN) and digestible crude protein (DCP) values were 64.8, 6.65; 66.42, 6.88 and 67.89 and 6.95 % for T_1, T_2 and T_3, respectively. Analysis of variance indicated that interaction among experimental rations was significant. Values of TDN in the control ration were lowest, it was significantly ($P<0.05$) lower than T_3, but the differences between them and T_2 or between T_2 and T_3 were insignificant. Values of DCP recorded by the group that received 75gm /h/d (T_3) were more highly significant (P<0.05) than those recorded by treatment received control ration (T_1), while differences between them and (T_2) were insignificant. These results indicated that TDN and DCP improved significantly by supplementing folic acid to the rations of buffalo calves. The increased nutrients digestibility in treatments T_2 and T_3 might be because of the greater TDN and DCP values for these treatments, as they were associated with higher OM, CP, and NFE digestibility coefficients.

CONCLUSION

Folic acid can be added to the diet of growing buffalo calves at a rate of 75 mg/h/d to improve feed conversion and increase daily gain and nutrient digestibility without any adverse effects.

REFERENCES

A.O.A.C. 1990: Association of official, chemists, official methods of analysis.15th Edition, Washington DC, U.S.A.

Abou-Akkada, A.R., El-Shazly, K. 1958: Studies on the nutritive value of some common Egyptian feed ingstuffs. II. Effect of concentrates rich in proteins on cellulose and dry-matter digestion. The Journal of Agricultural Science, 51(2), 157-163.

Bailey, L.B., Gregory, J.F. 1999: Folate metabolism and requirements. J. Nutr. 129, 779–782.

Cheng, K.F., Wang, C., Zhang, G.W., Du, H.S., Wu, Z.Z., Liu, Q., Guo, G., Huo, W.J., Zhang, J., Chen, L., Pei, C.X. 2020: Effects of betaine and rumen-protected folic acid supplementation on lactation performance, nutrient digestion, rumen fermentation and blood metabolites in dairy cows. Animal Feed Science and Technology 262 (2020) 114445. https://doi.org/10.1016/ j.anifeedsci.2020.114445

Dumoulin, P.G, Girard, C.L, Matte, J.J, Stlaurent, G.J. 1991: Effects of a parenteral supplement of folic acid and its interaction with level of feed intake on hepatic tissues and growth performance of young dairy heifers. J Anim Sci. 69:1657–1666.

Duncan, D.B. 1955: Multiple range and multiple F test. Biometrics. 11:1.

Evans, E., Mair, D.T., Gauthier, R., Fontaine, J. 2006: Effects of a protected vitamin and choline supplement in the transition period on dairy cow metabolic parameters and health. Professional Animal Scientist. 22:164–169.

Girard, C.L., Matte, J.J. 1997: Serum clearance and urinary excretion of folic acid in milk-fed and weaned calves. Can J Anim Sci. 77:69–75.

Girard, C.L., Benchaar, C., Chiquette, J., Desrochers, A. 2009: Net flux of nutrients across the rumen wall of lactating dairy cows as influenced by dietary supplements of folic acid. J Dairy Sci. 92:6116–6122.

Graulet, B., Matte, J.J., Desrochers, A., Doepel, L., Palin, M.F., Girard, C.L. 2007: Effects of dietary supplements of folic acid and vitamin B12 on metabolism of dairy cows in early lactation. J Dairy Sci 90, 3442–3455.

Hall, G., Cheng, E.W., Burrows, W. 1953: B-vitamins and other factors stimulatory to cellulose digestion by washed suspensions of rumen microorganisms. J Anim Sci 12, 918–919.

Kahraman, O., Citil, O.B., Alatas, M.S., Ozbilgin, A. 2015: Folic acid in ruminant nutrition. Anim Sci.58:140–143.

La, S., Li, H., Wang, C., Liu, Q., Guo, G., Huo, W.J., Zhang, Y.L., Pei, C.X., Zhang, S.L. 2019: Effects of rumen-protected folic acid and dietary protein level on growth performance, ruminal fermentation, nutrient digestibility and hepatic gene expression of dairy calves. J. Anim. Physiol. Anim. Nutr. 103, 1006–1014.

Liu, Q., Wang, C., Huang, Y.X., Dong, K.H., Yang, W.Z., Wang, H. 2008: Effects of isobutyrate on rumen fermentation, urinary excretion of purine derivatives and digestibility in steers. Arch Anim Nutr. 62:377–388.

Liu, Y.R., Du, H.S., Wu, Z.Z., Wang, C., Liu, Q., Guo, G., Huo, W.J., Zhang, Y.L., Pei, C.X., Zhang, S.L. 2020: Branched-chain volatile fatty acids and folic acid accelerated the growth of Holstein dairy calves by stimulating nutrient digestion and rumen metabolism. Animal 14, 1176–1183.

Longnecker, D.S. 2002: Abnormal methyl metabolism in pancreatic toxicity and diabetes. J. Nutr. 132, 2373S–2376S.

NRC. 1981: Nutrient requirements of goats, Angora. Dairy and meat goats in Temperate and Tropical Countries. 15 Ed., National Academy Press. Washington. D.C.

NRC. 2001: Nutrient requirements of dairy cattle. 7th rev. ed. Washington (DC): National Academies Press.

Parnian-Khajehdizaj, F., Taghizadeh, A., Hosseinkhani, A., Mesgaran, M.D. 2018: Evaluation of dietary supplementation of B vitamins and HMBI on fermentation kinetics, ruminal or post-ruminal diet digestibility using modified in vitro techniques. J. Biosci. Biotech 7, 125–133.

Petitclerc, D., Dumoulin, P., Ringuet, H., Matte, J., Girard, C. 1999: Plane of nutrition and folic acid supplementation between birth and four months of age on mammary development of dairy heifers. Can. J. Anim. Sci., 79:227–234.

Ragaller, V., Lebzien, P., Bigalke, W., Südekum, K.H., Hüther, L., Flachowsky, G. 2010: Effects of folic acid supplementation to rations differing in the concentrate to roughage ratio on ruminal fermentation, nutrient flow at the duodenum, and on serum and milk variables of dairy cows. Arch Anim Nutr. 64:484–503.

Ratriyanto, A., Mosenthin, R., Bauer, E., Eklund, M. 2009: Metabolic, osmoregulatory and nutritional functions of betaine in monogastric animals. Asian-Australas J Anim Sci 22, 1461–1476.

Slyter, L.L., Weaver, J.M. 1977: Tetrahydrofolate and other growth requirements of certain strains of Ruminococcus flavefaciens. Appl Environ Microb 33, 363–369.

SPSS. IBM Corp. Released 2020: IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp

Wang, C, Liu, Q., Guo, G., Huo, W.J., Ma, L., Zhang, Y.L., Pei, C.X., Zhang, S.L., Wang, H. 2016: Effects of rumen-protected folic acid on ruminal fermentation, microbial enzyme activity, cellulolytic bacteria and urinary excretion of purine derivatives in growing beef steers. Anim Feed Sci Technol. 221:185–194.

Wang, C., Wu, X.X., Liu, Q., Guo, G., Huo, W.J., Zhang, Y.L., Pei, C.X., Zhang, S.L., Wang, H., 2019: Effects of folic acid on growth performance, ruminal fermentation, nutrient digestibility and urinary excretion of purine derivatives in post-weaned dairy calves. Arch. Anim. Nutr. 73, 18–29.

Wang, C., Liu, C., Zhang, G.W., Du, H.S., Wu, Z.Z., Liu, Q., Guo, G., Huo, W.J., Zhang, J., Pei, C.X., Chen, L., Zhang, S.L. 2020: Effects of rumen-protected folic acid and betaine supplementation on growth performance, nutrient digestion, rumen fermentation and blood metabolites in Angus bulls. British Journal of Nutrition 123, 1109–1116

Wejdemar, K. 1996: Some factors stimulating the growth of Butyrivibrio fibrisolvens TC33 in clarified rumen fluid. Swedish J Agric Res. 26:11–18.

Yongjia, L., Zhang, J., Wang, C., Liu, Q., Guo, G., Huo, W., Chen, L., Zhang, Y., Pei, C., Zhang, S. 2022: Effects of folic acid and cobalt sulphate supplementation on growth performance, nutrient digestion, rumen fermentation and blood metabolites in Holstein calves. British Journal of Nutrition (2022), 127, 1313–1319.

Zhang, G.W., Wang, C., Du, H.S., Wu, Z.Z., Liu, Q., Guo, G., Huo, W.J., Zhang, J., Zhang, Y.L., Pei, C.X., Zhang, S.L. 2020: Effects of folic acid and sodium selenite on growth performance, nutrient digestion, ruminal fermentation and urinary excretion of purine derivatives in Holstein dairy calves. Livestock Science 231 (2020) 103884. https://doi.org/10.1016/j.livsci.2019.103884

Table 1: Chemical composition of CFM and wheat straw.

	Chemical composition of CFM %						
	DM	OM	CP	EE	CF	NFE	Ash
CFM	90	89.70	15.20	4.50	18	52	10.30
Wheat straw	91	89.5	3.0	1.5	41	44	10.5

Table 2: Effect of folic acid supplementation on growth performance of growing buffalo calves:

Items	Experimental rations		
	T_1	T_2	T_3
Average body weight gain			
Initial body wt.(kg)	209.5±19.38	197±14.45	198.25±13.52
Final body wt.(kg)	322±19.67	312.13±21.16	326.13±14.11
Total body gain (kg)	112.5^{b}±1.22	115.13^{ab}±6.8	127.88^{a}±0.72
Daily gain (g)	0.75^{b}±0.01	0.77^{ab}±0.05	0.85^{a}±01
Daily feed intake (kg/h/d)			
Roughage (kg) /h/d	3.03	3.03	3.03
CFM(kg)/h/d	5.85	5.76	5.82
Total DM feed intake(kg)/h/d	8.88	8.79	8.85
TDN (kg)/h/d	5.75±0.14	4.38±1.46	4.51±1.51
DCP (kg) /h/d	0.59±0.01	0.45±0.15	0.46±0.15
Feed conversion (kg intake\kg gain)			
DM(kg)/kg gain	11.84±0.19	8.64±2.96	7.82±2.62
TDN (kg)/ kg gain	7.67±0.19	5.73±1.95	5.31±1.79
DCP (kg) /kg gain	0.79±0.02	0.59±0.2	0.54±0.18

a, b, and c; means with different superscripts in the same row are significantly different from each other (P >0.05).

Table 3: Digestibility coefficients and nutritive values of the experimental rations.

Items	Experimental rations		
	T_1	T_2	T_3
DM	65.02^{b}±0.46	66.87^{ab}±1.06	69.06^{a}±0.43
OM	69.11^{b}±0.73	70.84^{ab}±0.47	72.33^{a}±0.64
CP	60.42^{b}±0.61	62.57^{a}±0.51	63.06^{a}±0.29
CF	60.23^{b}±0.7	62.83^{ab}±1	63.77^{a}±0.63
EE	65.84±1.65	67.7±0.28	70.53±3
NFE	75.94±0.82	77.12±0.81	79.03±0.68
Nutritive values %			
TDN	64.8^{b}±0.69	66.42^{ab}±0.44	67.89^{a}±0.72
DCP	6.65^{b}±0.07	6.88^{a}±0.04	6.95^{a}±0.03
C/P ratio	9.75±0.09	9.66±0.09	9.77±0.07

a, b, and c; means with different superscripts in the same row are significantly different from each other (P >0.05).

الأداء الإنتاجي لعجول الجاموس المغذاة على علائق مدعمة بحمض الفوليك

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الملخص العربي:

استخدم في هذه الدراسة عدد خمسة عشر عجل جاموسي بمتوسط وزن 181 كجم ± 0.2، قسمت بشكل عشوائي إلى ثلاث مجاميع غذائية (خمسة حيوانات في كل مجموعة) وذلك لدراسة تأثير إضافة حمض الفوليك على أداء نمو ذكور الجاموس، وكذا معدلات هضم العناصر الغذائية. تم تغذية الحيوانات داخل المجموعات على أحد العلائق التجريبية التالية: المجموعة الأولى (مجموعة الكنترول T_1): غذيت على العليقة الأساسية (15.2٪ بروتين خام دون إضافة حمض الفوليك). المجموعة الثانية (T_2): تغذت على العليقة الأساسية مضافاً إليها 50 مجم حمض الفوليك / رأس/ يوم المجموعة الثالثة (T_3): غذيت على العليقة الأساسية مضافاً إليها 75 مجم حمض الفوليك / رأس / يوم. كان معدل الزيادة اليومية المسجل بواسطة T_2 (0.77 كجم / رأس / يوم) أعلى إلى حد ما من T_1 (0.75 كجم / رأس / يوم) تلتها T_3 (0.85 كجم / رأس / يوم). كان الزيادة اليومية للعجول التي حصلت على 75 ملجم من حمض الفوليك / رأس / يوم أعلى معنوياً من التي حصلت على العليقة بدون حمض الفوليك (الكنترول)، ولم يكن هناك تأثير معنوي لإضافة حمض الفوليك على المادة الجافة الكلية المأكولة وكفاءة تحويل الغذاء. كانت معاملات الهضم لـ DM وOM وCF في مجموعة T_3 أعلى معنوياً من T_1 (مجموعة الكنترول)، لكن الاختلافات بين T_1 وT_2 أو T_2 و T_3 في معاملات الهضم هذه لم تكن معنوية. سجلت المجموعة الثالثة أعلى قيمة لهضم البروتين بينما سجلت المعاملة الأولى أقل قيمة، وكانت الفروق بينهما غير معنوية. أظهرت النتائج تحسن كل من TDN وDCP معنوياً بإضافة حمض الفوليك لعلائق عجول الجاموس. وبناءً على هذه النتائج فإنه يمكن إضافة حمض الفوليك إلى العلائق المقدمة لعجول الجاموس النامي بمعدل يصل إلى 75 مجم / رأس / يوم لتحسين معدل تحويل الغذاء والزيادة المكتسبة في النمو يومياً وكذلك تحسين هضم العناصر الغذائية دون أي آثار ضارة على العجول النامية.

الكلمات الاسترشادية: