EFFECT OF USING SODIUM BICARBONATE AND MIXTURE OF VITAMIN E AND SELENIUM IN PRODUCTION PERFORMANCE OF AWASSI EWES

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ABSTRACT

This study was conducted by using18 Awassiewes , 2-4 years aged, with average body weight 61.56 kg. The ewes were randomly divided into three groups, six ewes in each group. All ewes received 1.5 kg/ dry matter from the same basal diet consist mainly of barley, wheat bran, soybean meal and wheat straw . The first group was fed on basal ration only (T1) ,while 45g /ewe /day sodium bicarbonate was supplemented to the feed of the second (T2)group and third (T3) group was supplemented with 45g sodium bicarbonate plus 0.5g mixture of Vitamin E and selenium /ewe/day. Results showed that the treatments hadsignificant increase(P < 0.05) on milk production of T3(739 g/d) than T1,T2(571and 599 g/d)respectively. No effect on average body weight, lactose, fat and protein percentage in milk. Rumen liquor pH, ammonia and total count of rumen bacteria and protozoa before feeding was not affected, while after 2hr of feeding, pH value of rumen liquor was increased (P < 0.05) in T2 6.65 as compared with T1 5.62 and T3 6.13. Ammonia and microorganism concentration in rumen liquor and blood parameters were not affected by experimental treatments.

Key words: Vitamins, sheep, milk production

تأثير استخدام بيكاربونات الصوديوم وخليط فيتامين E والسيلينيوم في الأداء الإنتاجي للنعاج العواسية

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المستخلص

أجريت الدراسة باستخدام 18 نعجة عواسية، تراوحت أعمارها بين2–4 سنة، ومعدل أوزانها 61.56 كغم، قسمت النعاج عشوائياً تبعا لأعمارها وأوزانها وإنتاجها من الحليب إلى ثلاثة مجاميع بحيث ضمت كل مجموعة ستة نعاج، غذيت الحيوانات في كل مجموعة يوميا بمعدل 1.5 كغم مادة جافة/ نعجة على عليقه واحدة تكونت من الشعير ونخالة الحنطة وكسبة فول الصويا والتبن ، غذيت حيوانات المجموعة الأولى (السيطرة) بدون أية إضافة، فيما تم إضافة 45 غم/ نعجة / يوم بيكاربونات الصوديوم لعليقه المجموعة الثانية, في حين أضيف لعليقه المجموعة الثالثة خليط مكون من 45 غم بيكاربونات الصوديوم و0.5غم خليط فيتامين E والسيلينيوم / نعجة / يوم. أظهرت النتائج وجود تفوق معنوي(P <0.05)في إنتاج الحليب اليومي حيث تفوقت المعاملة الثالثة (739 غم / يوم)على المعاملتين الأولى والثانية(571 و 599 غم / يوم) على التوالي. نسب مكونات الحليب من اللاكتوز والدهن والبروتين والمواد الصلبة لم تختلف معنويا بين المعاملات, أما كميات هذه المكونات في المنتج اليومي من الحليب فقد تحسن معنويا (P <0.05)في المعاملة الثالثة مقارنة بالمعاملتين الأولى والثانية. الأس الهيدروجينيلسائل الكرش (pH) لم تختلف معنوياً قبل التغذية, في حين لوحظ فروقات معنوية (P <0.05)في قيمة الأس الهيدروجينيلسائل الكرش (pH) بعد ساعتين من التغذية إذ بلغت 5,62 و6,65 و6,13 على التوالي، فقد تفوقت المجموعة الثانية على المجموعة الثالثة والتي تفوقت معنوياً عن المعاملة الأولى. بينما لم تصل الفروقات إلى مستوى المعنوية بين المعاملات في تركيز الأمونيا وأعداد البكتريا لسائل الكرش قبل التغذية وبعدها بساعتين. وكانت الفروقات غير معنوية لبعض قياسات الدم.

الكلمات المفتاحية: فيتامينات، اغنام، انتاج الحليب

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INTRODUCTION

There are many ways to improve milk production (quantity and quality)providing suitable environmental conditions of the rumen and exploitation of nutrients compounds and metabolism in addition to health care of the somatic cells of the udder. Animals need good feed to produce milk. Notes after birth, and there is a growing need for animal food to produce milk and this may render the animal in the case of the balance of negative especially if the production is high(14), may be exposed females after giving birth to stress due of milk, especially those with highly productive result of the deterioration of the immune status and low concentration antioxidants in the body, leading to increased opportunities for exposure to disease, particularly mastitis (22, 23). The reliance on concentrated feed for long periods, especially animals with high milk production, as well as multiple and twin birthscauses byreduction Vitamin E and selenium to meet the requirements (33).As it is known that green fodder is considered one of the most important sources for this Vitamin. The importance of Vitamin E and not only for being an anti-oxidants and the positive effect of Vitamin E to improving the immunity of animals and reproductive performance. It was observed during the recent research that the addition of Vitamin reduces the number of somatic cells in milk (Somatic Cell Count) and increase the growth of bacteria analyst cellulose in the rumen and acid production as consumption of concentrated feed by animals, especially cereals, which contain a high percentage of quick fermentation carbohydrate decrease and the pH of rumenliquor, causing determine the activity of rumen bacteria in which especially cellulolytic bacteria and reduce the proportion of acetate to propionate and low fat milk (9), and that the add rates acidity such as sodium bicarbonate and others can havepositive role in improving the percentage of milk fat and milk production (31).This study was designed to find out theeffect of mixture Vitamin E with selenium and sodium bicarbonate on the rumen characteristic and their impact on milk production and its components in Awassi ewes.

MATERIALS AND METHODS

This study was conducted with 18 Awassi ewes, aged 2-4 years and average body weight 61.56 kg. Ewes were randomly arranged to three experimental groups according to their age, body weight and milk production,6ewes/group. Animalsfed 1.5 kg dry matter / ewe of basal ration that consisted of barley, wheat bran, soybean meal,wheat straw and Urea(Table 1). (T1) basal diet, (T2) basal diet + 45g /ewe /day sodium bicarbonate and (T3) basal diet + 45g sodium bicarbonate + 0.5g Vitamin E and selenium/ewe/day.Sodium bicarbonate,Vit E and Selenium added handily to ration before feeding animals at morning daily.

Table 1. The formulation and chemical composition of whole ration.

Components	%
Barley	61
Wheat bran	22.25
soybean meal	7
wheat straw	8
Urea	0.75
Salt + limestone	1
Chemical composition of the diet%	
Dry matter*	92.95
Organic matter*	93.84
Crude fiber*	8.22
Ether extract*	2.96
Crude protein*	14.97
Metabolizabl energy Mcal/kg of DM**	2.567

***Estimated composition according to (3).**

*** Calculated on a dry matter basis according (20).**

The study lasted for 50 days after the adaptation period of 10 days, during which samples of milk(20%of milk production)were taken every 10 days after the lactation of ewes (twice daily) for chemical analysis by device(JulieZ7, Milk Analyzer) European origin.Samples of blood were taken from the vein(19) to measure glucose,cholesterol, triglycerides, total protein, albumin and blood urea(12).Blood enzymes Alanin amino

transferase (ALT) and Aspartate amino transferase (AST)were also measured.Samples from rumen liquor were also taken before feeding and after 2hr of feeding (4)and withdrawn by pump section and measured pH directly using a pH meter(12),ammonia concentration(8,21) and estimated total count of rumen bacteria and protozoa according to (4) and the numbers refer to the logarithm of real number. Rationsampleswere analyzedto determine the percentage of dry matter, organic, crude protein, ether extract and crude fiber (4). Blood samplesand measurement of urea milk were analyzed using several analytical ready kits-German type (Biomerue)using spectrophotometer(Auto-analyzer, spectrophotometer RA-1000,UK). The results were statistically analyzed by Electronic Calculator application of Statistical Analysis System (30) using the completely random design (CRD) and Dancan test used to test the differences between treatments(13).

RESULTS AND DISCUSSION

Results revealed that there are no significant differences in body weight of ewes between treatments(Table 2). The ewes weights ranged 65.12 to 66.82 kg at the end of the experiment. Improvement in average daily milk yield was observed (P <0.05) in treatment 3 as compared with treatments 1 and 2.(6 ,14 and 27)mentioned a decrease in pH below 5.7 leads to lower milk production and the percentage of fat in the milk , this decline leads to increase activity of microorganisms producing propionicacid, which has a big role in reduced milk production and the percentage of milk fat.(23 and 24) stated that the addition of a mixture of Vitamin E to the diets of sheep led to reduce the number of dead udder cells in milk (Somatic Cell) up to 50% in milk as well as increase the amount of milk production. Perhaps the reason forimproving milk production using these additives in this study.Table 2 shows that the best production of milk by using a mixture of bicarbonates andVitamin E.The addition of sodium bicarbonate to the bush has an effect on maintaining pH of the rumen liquor. It was obtained that the presence of Vitamin E the activity of the microorganisms was ideal to exploit nutrients by increase utilization with reflected positively in the production of milk and milk fat.

Table 2. Impact of addition Vit. E and selenium or NaHCO3 to the ration in the production of milk and it's components ratios in Awassi ewes.

Item	T1	T2	T3
Initial BW, kg	61.57± 4.55	61.79± 5.62	61.33± 3.95
Final BW, kg	65.12± 4.26	65.94± 6.14	66.82± 4.21
Milk yield, g/d	571 ± 35.9 b	599 ± 27.3 b	739 ± 13.1 a
Total milk yield, kg/ewe	28.55 ± 1.64 b	29.95 ± 1.39 b	36.95 ± 1.91 a
Lactose%	5,31 ± 0,32	5,54 ± 0,21	5,99 ± 0,17
Fat%	6,32 ± 0.13	6,95 ± 0.11	6,68 ± 0.11
Protein%	4,33 ± 0,59	4,41 ± 0,41	4,38 ± 0,24
Solids-not-fat%	10,95 ± 0,18	10,87 ± 0,17	10,92 ± 0,27

Horizontally different character Indicates to significant differences (P<0.05).

Components ratios of lactose and milk fat(6.32,6.95and6.68%), protein(4.33,4 .41and4.38%)andtotal solids (10.95, 10.87 and 10.92%) did not differ respectively. The results show in the table (3) an improvement (P<0.05) in favor of the third treatment in the amount of lactose 30.32, 33.18, and 44.26 g / day and fat 33.56, 41.63, and 49.37 g / day and protein 24.72, 26, 42 and 32.37 g / day, while were not significant differences between the treatments in the concentration of urea in milk as it ranged between 24.71- 24.82. The reason for the increase in the amounts of lactose, fat and protein produced daily in treatment 3 due to its superiority evident in the rate of the amount of milk produced per day and the reflection of this in the components of milk, although the differences in ratios of these components were not significant. As noted from the table (4) that the amount of fat in treatment 2 was surpassed the treatment 1 and, perhaps, sodium bicarbonate has an important role to maintain the pH value decline and works to improve the conditions of the rumen cellulolytic bacterial and thus an increase in the production of acetic acid, which plays an important role in the composition of milk fat (9), as noted for the treatment 3 and treatment 2 in the daily quantity of milk fat product with

addition of a mixture of sodium bicarbonate and Vitamin E.(2, 6 and 27) stated that the addition of Vitamin E to the diets led to raise the proportion of fat in milk compared with rations no Vitamin added this is to lower production of fatty acid Trans -10, cis-12, which has a negative role in the production of milk and milk fat, and acts of Vitamin E and selenium to enhance the growth and function of cellulolytic bacterial producing fatty acid trans-11, which is the main source for the production of unsaturated fatty acid (C18: 2) in the mammary gland addition to the important role of Vitamin E in maintaining the somatic cells and impact positively on the production of milk (21). These results were consistent with (2, 10, 11, 16, 18, 26, 28, 29 and 32)

Table 3. Effect ofaddition Vit. E and selenium or $NaHCO_3$ to the rationin the amount of lactose, fat, protein and urea in milk

Item	T1	T2	T3
milk lactose g/day	30.32 ± 1.24 b	33.18 ± 1.28 b	44,26 ± 1,53 a
milk fat g/day *	33.56± 2.42 c	41.63 ± 2.31 b	49.37± 2.17 a
milk protein g/ day	24.72 ± 2.37 b	26.42 ± 2.81b	32.37± 2.19 a
milk urea mg/100 ml	24.71 ± 2.22	24.82± 2.38	24.69± 2.19

Horizontally different character Indicates to significant differences (P <0.05).

(Table 4) results pH values ofrumen before feeding 6.65, 7.04 and 6.82 for T1,T2 and T3 respectively, differences in pH value means the rumen before feeding, and after a two-hour of feeding can be seen in the table (4) that value of rumen pH were 5.62, 6.65 and 6.13 were elevated significantly (P<0.05) in the second treatment, as compared to the third treatment which in turn on the first treatment. The use of concentrated feed lead to increase concentration of acidity propionic and lower pH of the rumen, and perhaps this was evident in the treatment 1 since dropped the pH value compared to other treatments, on the contrary in operating treatment 2 rising pH significantly. pH has dropped in treatment 3 despite add mixture bicarbonates and Vitamin E and selenium may due to the change in output fermentation rumen as a result of improving the conditions of the rumen using this mixture to the ration,and a reflection positively in activity of microorganisms within the rumen, which will lead possibly to increase the concentration of organic acids and which have the primary role to the low pH within the rumen (27). No significant differences were observed in concentration of ammonia in the rumen before feeding ranging between 8.37 - 8.85 mg / 100 ml and after two hours of feeding 11.34 - 11.82 mg / 100 ml.

Table 4. Effect of the addition Vit E and selenium or NaHCO3 to the ration in some of rumen characteristics before feeding and two hours after feeding

	Before feeding			After feeding		
	T_1	T_2	T_3	T_1	T_2	T_3
pH	6.65 ± 0.06	7.04 ± 0.9	6.82 ± 0.04	5.62 ± 0.08 c	6.65 ± 0.14 a	6.13 ± 0.17 b
ammonia mg/100 ml	8.85 ± 1.05	8.37 ± 0.94	8.71 ± 1.34	11.82 ±1.39	11.34 ± 1.41	11.77 ± 1.07
Log number of bacteria/ml	9.33 ± 0.08	9.41 ± 0.12	9.49 ± 0.14	11.22 ± 0.25	11.21 ± 0.18	11.29 ± 0.21
Log number of protozoa/ml	6.57 ± 0.28	6.49 ± 0.31	6.42 ± 0.29	6.99 ± 0.16	6.91 ± 0.13	6.95 ± 0.19

Horizontally different character Indicates to significant differences (P<0.05).

Table(4) showed bacterial count 9.33, 9.49 and 9.41 log/mlrumen liquor, protozoa 6.57, 6.49 and 6.42 log/mlof rumen liquor before feeding and after 2hrs of feeding. The bacterial count were 11.21, 11.22and 11.29 log/mlrumen liquor and protozoa were 6.99, 6.91 and 6, 95 log/mlrumen liquor fortreatments 1, 2, and 3 respectively. Results showed no significant effect between the three treatments under the rate of glucose blood concentration in the blood plasma as it ranged from 80.33 to 80.91 mg / 100 ml and the triglycerides 91.01 to 92.55 mg / 100 ml and cholesterol from 121.31 to 124.14 mg / 100 ml total protein and 8.31 - 8.72 g / 100 ml and albumin from 4.79 - 4.96 g / 100 ml, globulin 3.52 - 3.82 g / 100 ml and urea 33.96 to 34.82 mg / 100 ml and enzymatically ALT (18.33, 18.64 and 18.69IU / L) and AST (16.13, 16.35 and 16.94 IU / L) respectively.The results of this study were suitablewith has been reached in other studies

used some of the food additives in the diets of animals, milk, (31) noted that the addition 3% of sodium to Awassi ewes did not have significant effect in the concentration of total protein, glucose, cholesterol, triglycerides and urea in the blood, so did not notice by(1, 2 and 25) and a significant effect in the glucose concentration and total protein, triglycerides, cholesterol, urea, enzyme ALT and AST in the blood of sheep when you add Vitamin E and selenium were added to the diets of ewes.

Table 5. Effect of theaddition Vit E and selenium or $NaHCO_3$ to the rationin some blood measurements

Item	T1	T2	T3
glucose mg/100 ml	**80.41± 1.14**	**80.91± 1.22**	**80.33± 3.22**
triglycerides mg/100 ml	**91.32± 5.52**	**92.01± 7.41**	**92.55± 8.37**
cholesterol mg/100 ml	**124.14± 11.34**	**123.61± 17.52**	**121.31± 15.71**
total protein g/100 ml	**8.31± 2.25**	**8.64± 1.12**	**8.72±1.45**
albumin g/100 ml	**4.79± 1.01**	**4.82± 1.07**	**4.96±1.26**
globulin g/100 ml	**3.52± 0.91**	**3.82± 0.82**	**3.76± 0.73**
urea mg/100 ml	**33.96± 3.81**	**34.01± 3.67**	**34.28±3.13**
ALT IU/L	**18.33± 1.94**	**18.64± 0.1.19**	**18.19± 1.58**
AST IU/L	**16.13± 2.64**	**16.35± 2.42**	**16.94± 1.32**

Horizontally different character Indicates to significant differences (P<0.05)

REFERENCES

1. Al- jubori, O. S. H. 2017. Synergistic effect of ginger, propolis added to concentrated diet on some production and physiological characteristics of the Awassi ewes. Iraqi J. of Agric. Sci.,48,2: 252-255

2. Almallah, O. D., N. Y. Abbou, M. N. Abdullah and I. G. Abdullah. 2011. Familiar with the effect of adding sunflower oil and Vitamin E to the diets in the production of milk and its components and some blood measurements in ewes Alauasih. Journal of Planting Mesopotamia,39,4: 159-167

3. Association of official analytic chemists (A.O.A.C.).2002. Official methods of analysis 13th ed., Washington, DC

4. Atlas, R.M. ; L.C. Parks and A.E. Brown. 1995. Laboratory Manual of Experimental Microbiology. Mosby-Year Book, Tnc., Missouri.

5. Baily, W. R. and E. G. Scott.1994. Diagnostics Microbiology.9th ed. Mosby, Saint Louis

6. Bell, J. A., J. M. Griinari and J. J. Kennelly. 2006. Effect of safflower oil, flaxseed oil, monensin, and Vitamin E on concentration of conjugated linoleic in bovin milk fat . J. Dairy. Sci 89: 733-748

7. Bernard, L., C. Leroux, and Y.Chiliard.2008.Expression and nutritional regulation of lipogenic in the ruminant lactatingmammary gland.Adv.Exp.,Med.Biol. 606:67-108

8. Broderick, G. A. and J. H. Kang. 1980.Automated simultaneous determination of ammonia and amino acids in ruminal fluid and in Vitro media . J. Diary Sci 33:64-75

9. Cerrato-Sanchez, M., S. Calsamiglia, and A. Ferret. 2007. Effects of time at suboptimal pH on rumen fermentation in a dual-flow continuous culture system .J.Dairy Sci.90:1486-1492

10. Chan, P. S., J. W. West, J. K. Bernard, and J. M. Fernandez. 2005.Effects of dietary cation-anion difference on intake, milk yield, and blood components of the early lactation cow. J.Dairy Sci. 88:4384-4392

11. Cottee, G. I. Kyriazakis, T. M. Widowski, M. I. Lindinger, J. P. Cant, T. F. Duffield, V. R. Osborne, and B. W. McBride.2004.The effects of subacutruminal acidosis on sodium bicarbonate-supplemented water intake for lactating dairy cow. J.Dairy Sci. 87:2248-2253

12. Doumas, B. T. and H. G. Biggs.1972. The Colorimetric Determination of Total Protein in Serum or Plasma. Standard Methods of Clinical Chemistry. Vol. 7, Academic Press New York., USA

13. Duncan, C. B.1955. Multiple rang and Multiple " F " test. Biometric 11 : 1-12

14. Economides, S.1986. Comparative studies of sheep and goat milk yield, composition and growth rate of lamb and kids. J. Agric. Sci (Camb).10- 477

15. Fuentes, M. C., S. Calsamiglia, P. W. Cardozo, and B. Vlaeminck. 2009.Effect of pHand level of concentration in the diet on the production of biohydrogenationintermediates in a dual-flow continous culture. J.Dairy Sci. 92:4456-4466

16. Gomez-Cortez, P., P. Frutos , A. R. Mantecon , M. Juarez , M. A. De La Fuente and G. Hervase.2008. Milk production, conjugated linoleic acid content, and in Vitro ruminal fermentation in response to high levels of soybean oil in dairy ewe diet. J. Dairy. Sci. 91: 1560-1569

17. Hassan, S. A. and S. F. Mohammed.2016.Effect of saccaromyces cerevisiae supplementation on rumen characteristics in Awassi lambs fed diets with different roughage to concentrate ration . Iraqi J. of Agric. Sci.47: (Special Issue): 1-11.

18. Hervas, G., P. Luna , A. R. Mantecon , N. Castanares , M. De La Fuente , M. Juarez and P. Frutos.2008. Effect of diet supplementation with sunflower oil on milk production, fatty acid profile and ruminal fermentation in lactating dairy ewe. J. Dairy . Res. 75: 399-405.

19. Jain, S.C., Louhuja, N.K. and A. Kapoor.1987.(trigonellafoenumgraecumlinn) hypoglyceamic agent Indian. J. Pharm. Sci. 49: 113-114

20. Khawaja, A. K., I. A. al-Bayati and S. A. A. Matthew.1978. Chemical Composition and Nutritional Value of Feed Materials Iraqi Ministry of Agriculture and Agrarian Reform, the General Directorate of Livestock

21. Legleiter, L. R. , A. M. Mueller and M. S. Kerley.2005. Level of supplemental protein dose not influence the ruminal undegradable protein value. J. Anim. Sci. 83: 863-870.

22. Moeini, M. M., H. Karami and E. Mikaeili.2009. Effect of selenium and Vitamin E supplementation during the late pregnancy on reproductive indices and milk production in heifers. Animal Reproduction Science. 114 (1): 109-114

23. Merkhan . K. Y., K. N. Mustafa, R. H. Isa, M. S. Q. Barwary, E. T. Buti and C. A. Yatem, 2019.Evaluation of medicinal plants (*quercus infectoria and astracus eriocephalus*)as feed additivesin Awassi ewe's ration.1.digestibility, milk yield and composition. Iraqi J. of Agric. Sci.,50,1:115-525

24. Morgante, M., D. Beghelli , M. Pauselli , P. Dallara , M. Capuccella and C. Ranucci.1999. Effect of administration Vitamin E and selenium during the dry period on mammary health and milk cell count in dairy ewes. J. Dairy. Sci. 82: 623-631

25. Musawi, J. E., A. F. AL-Kalisy and H. K. Ibraheem. 2016. Effect of grinded olive leaves supplementation in milk production and its component and some blood traits in native does. Iraqi J. of Agric. Sci .47, 5:4531-4537.

26. Oba, M., and M. S. Allen.2003.Effects of interaruminal infusion of sodium, potassium, and ammonium on hypophagia from propionate in lactating dairy cows. J.Dairy Sci. 86:1398-1404

27. Pottier, J., L. M. Focant, C. Debier, G. De Buysser, C. Goffe, E. Mignolat, E. Froidmont and y. Larondelle.2006 . Effect of dietary Vitamin E on rumen biohydrogenation pathways in milk fat depression in dairy cow fed high-fat diets. J. Dairy Sci. 89: 685-692

28. Qassim, M. M. and M. N. Abdullah. 2014.Effict of using reduced ruminal degradability ration on milk production, some blood parameters and lamb growth in Awassi ewes. Iraqi J. of Agric. Sci.(Special Issue) ,45,3:313-321

29. Qiu, X., M. L. Eastridge, and J. L. Firkins.2004.Effects of dry matte intake, addition of buffer, and source of fat on duodenal flow and concentration of conjugated linoleic acid and trans-11 C18:1 in milk.J.Dairy Sci.87:4278-4286

30. Russell, James, B. and Jo May Chow.1993. Another theory for the action of ruminal buffer salts:Decreasedstarch fermentation and propionate production. J.Dairy Sci. 76:826-830

31. SAS.2000. Users Guide: Statistics. Version 8th ed.SAS Institute Inc., Cary, NC

32. Tayeb, M. A. M., G. K. khattab, G. I. Abdullah and S. A. Ali. 2011.The effect of using different ratios of sodium bicarbonate in diets ewes Alawasi the milk components. Journal of planting Mesopotamia, Volume 39, Issue 4: 108-116

33. Zervas, G., K. Fergeros, K. Koytsotolis, C. Goulas and A. Matzios. 1998. Soy hulls as a replacement for maize in lactating dairy ewe diets with or without fat supplement. Anim. Feed. Sci. Tech. 76: 65-75.