

EFFECTS OF PARTIALLY REPLACING EWE'S MILK BY SOY MILK ON THE PERFORMANCE OF NEW-BORN LAMBS.

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SUMMARY

To investigate the effect of partially substituting ewe's milk by two levels of soy milk on lamb's performance, a total number of 15 new-born Ossimi lambs (6 females and 9 males) 5-6 day of age and 3.7 ± 0.1 kg LBW, were used after they were fed on the colostrum. Experimental lambs were randomly divided into three experimental groups. Each consists of five lambs and was artificially fed during the suckling period-(the first period, the first 15 d of the experiment) on either ewe's milk (control group, G₁), 50% ewe's milk plus 50% soy milk (G₂) or 25% ewe's milk plus 75% soy milk. (G₃). In the second period (liquid plus solid feeding), lambs were fed on the same milk beside a lamb starter starting from the third week of the experiment. The liquid diets and the starter were offered ad-libitum. Three lambs from each group were used to estimate nutrient digestibility coefficients.

The results during the first period show that lambs fed on 50% soymilk plus 50% ewe's milk (G₂) had the lowest ($P < 0.05$) final body weight gain. However, the differences of total gain and consequently, average daily gain were not significant ($P > 0.05$). Daily dry matter (DMI) and crude protein intakes (CPI) for lambs fed on ewe's milk were significantly ($P < 0.05$) lower than those of the other groups. Gain: intake ratio of different experimental groups indicate that lambs fed on ewe's milk only had significantly ($P < 0.05$) the best value.

During the second period, liquid and solid feeding period, no significant differences in the final weights and total gains were detected among the experimental groups. Lambs of G₂ consumed significantly ($P < 0.05$) the highest amount of daily DM from liquid diet and lowest DMI from starter. Gain: feed intake ratio during the second feeding period indicate that lambs fed 75% soymilk (G₃) were better than those fed ewe's milk (G₁) or 50% soymilk (G₂). Digestion co-efficient of DM and CP were significantly ($P < 0.05$) higher for lambs of G₃ than those of G₁ and G₂.

Lambs performance over the entire experimental period showed that no significant differences were detected among the groups for final body weights, total gains and daily total DMI. No significant differences were observed among the groups for feed efficiency during the entire experimental period either when expressed as DMI or by CPI.

According to the results reported here, it can be concluded that soymilk can be used successfully in rearing new-born lambs.

Key words: *Partially replacing, soy milk, lamb performance*

INTRODUCTION

It has proved difficult to find an acceptable alternative to milk proteins, the major cost ingredient of milk replacer. Soybeans are a source of high

quality, relatively inexpensive protein that has potential for use in milk replacers. However, it is recognized that soybean contain antinutritional factors, which limit their use as a protein source for milk replacers (Gorrill and Thomas,

1967 and Reddy *et al.*, 1993). The use of other vegetable protein sources also, results in impaired curd formation in the abomasum, which can further reduce protein digestibility and growth. Replacement of milk proteins by soybean protein concentrate, roasting soybean, extruded soybean, ethanol-extracted soybean, fermented soybean, heated soybean or isolated soybean protein has tested and resulted with increased animal growth rates and performance (Gorrill and Thomas, 1967; Campos *et al.*, 1982; Elliott *et al.*, 1988; Mir *et al.*, 1991 and Reddy *et al.*, 1993). However, there is no information on using soymilk in lamb milk substitute.

Therefore, this work aimed to study the effect of partially substituting ewe's milk by two levels of soy milk on Ossimi lamb's performance.

MATERIALS AND METHODS

This work was carried out at the Agriculture Farm Station of Faculty of Agriculture, Ain Shams University, located in Shalaaqan, Kaliobia, 20 km, North Cairo, Egypt, to investigate the effect of partially substituting ewe's milk by two levels of soy milk on lamb's performance. The experiment was divided into two experimental periods, mainly the liquid feeding period (15 d) and the liquid plus solid feeding period (from the 16th d up to weaning).

A total number of 15 new-born Ossimi lambs (6 females and 9 males) 5-6 day of age and 3.7 ± 0.1 kg LBW, were used after they were fed on the colostrum. Experimental lambs were randomly divided into three experimental groups. Each consists of five lambs and was artificially fed on one of the following liquid feed during the first period

G₁: lambs were fed artificially on ewe's milk (control group).

G₂: lambs were fed on 50% ewe's milk plus 50% soy milk.

G₃: lambs were fed on 25% ewe's milk plus 75% soy milk.

In the second period (liquid plus solid feeding), lambs were fed on the same liquid feed beside a lamb starter starting from the third week of the experiment. The chemical composition of ewe's milk, soy milk, experimental diets and the starter are presented in Table (1).

The liquid diets and the starter were offered ad-libitum. All the experimental animals were fed the liquid diets artificially using bottle with rubber teat even the control group. The amount was recorded daily for each lamb. Fasting weight were recorded weekly before the morning feeding until the end of the experiment.

Soymilk used in this trial was prepared by Food Technology Research Institute, Agricultural Research Center, Ministry of Agriculture from dry mature whole soybean seeds according to Tanteeratarm, *et al.* (1992) Methods.

Preparation of the liquid diet

Soy milk was mixed well with ewe's milk at two levels of 50 and 75% for G₂ and G₃, respectively, and then offered immediately to animals at 37-40°C four times a day (8 h. a.m. 11 h. a.m. 2 h. pm and 5 h. pm). Methionine was added to soy milk in the rate of 0.2 g / liter.

Vitality of the experimental lambs was judged according to the incidence of diarrhea and visual examination of different regions of the body (e.g. hair, muzzle and rectal temperature), when frequent diarrhea was occurred, it was immediately treated by antibiotics.

Digestibility trials.

Three lambs from each group were used to estimate nutrient digestibility coefficients. The digestion trial was carried out at the second experimental

period (liquid plus solid feeding) when lambs reached 10th week of age. Nylon bag technique was used where, feces were collected and weighted fresh. 10 ml of 10% sulphuric acid and 10 ml of formalin were sprayed to the collected feces for preservation, and then the samples were dried in an oven at 70°C for constant weight. At the end of the collecting sample period, feces samples of each animal were grounded, mixed well and kept in plastic bottles for chemical analysis.

Chemical and statistical analysis

Dry matter, CP, EE, CF and ash of milk replacers, starter and feces were chemically analyzed according to the A.O.A.C. methods (1995). The nitrogen free extract (NFE) was calculated by subtracting.

The data of growth rates, feed intakes, feed efficiency and nutrient digestibility were analyzed according to statistical analysis system, (SAS) User's Guide, (1998).

RESULTS AND DISCUSSION

Liquid feeding period:

Data of Table (2) show that no significant difference was detected among the mean of initial live body weight (LBW) of the different experimental groups although, that of G₂ was slightly lower (3.46 kg) than those of G₁, G₃ (3.94 kg). However, there was significant difference ($P < 0.05$) between the final body weights of the lambs of G₂ and the other groups (G₁ and G₃ lambs) at the end of this period (15 days; Table, 2) where lambs which were fed on 50% soymilk plus 50% ewe's milk (G₂) had the lowest value (5.19 kg), while those fed on ewe's milk only (G₁) or on 75% soymilk plus 25% ewe's milk (G₃) had higher final live body weight (5.76 and 5.70 kg, respectively). Nevertheless, the differences of total gain and

consequently, average daily gain were not significant ($P > 0.05$), although lambs of G₂ grew slightly lower (115±5.9 g/d) than those of G₁ (121±6.4 g/d) and G₃ (117±6.0 g/d). This may due to that lambs of G₂ started with the lowest ($P > 0.05$) mean LBW but grew as much as the other groups.

The results in Table (2) also, show that average daily dry matter (DMI) and crude protein intakes (CPI) for lambs of G₁ were significantly ($P < 0.05$) lower than those of G₂ and G₃ lambs. Soymilk-fed lambs (G₂ and G₃) consumed 126 and 122% DMI and 137 and 139 % CPI more than that of ewe's-fed lambs (control group, G₁), respectively. However, lambs of G₁ which fed on ewe's milk only had significantly ($P < 0.05$) the best value for feed conversion where each g of DMI and CPI gave 1.31 and 3.81 g gain, respectively. Corresponding values for lambs of soymilk-fed groups (G₂ and G₃), which were fed on ewe's milk plus either 50% or 75% soymilk, were 0.99 and 2.65 or 1.03 and 2.65 g, respectively which was slightly lower than that of control group. This may be due to that soymilk protein lack the unique ability of casein to coagulate in the abomasum of suckling lamb. Beneficial effect of curd formation have been reported by Jenkins and Emmons (1979); Guilloteau *et al.* (1986) and Cruywagen (1990). Also, it may due to lack of suitable enzyme system for lambs of G₂ and G₃ in this ages which can utilize soymilk nutrients well, while those fed on ewe's milk (G₁) had the enzyme system which could be utilize ewe's milk nutrients well. The same observations were reported by Havrevoll, *et al.* (1991); Pinna, *et al.* (1993); Lopes, *et al.* (1998) and Moutagne, *et al.* (2001) who reported that daily gain for lambs fed on ewe's milk was better than those fed on milk substitute especially in early ages.

Table (1): Chemical composition of ewe's milk, soy milk, diets and the lamb starter (g/kg).

Item	T.S.	CP	EE	NFE	Ash	CF
Ewe's milk for G ₁	183	63	65	47	8.0	-
Soymilk	92	40	24	23	4.8	-
Diet of G ₂ *	137.5	51.5	44.5	35	6.5	-
Diet of G ₃ **	114.8	45.8	34.3	29	5.7	-
The starter***	914	193	29	509	69.0	114

* Consisted of 50% ewe's milk and 50% soy milk

** Consisted of 25% ewe's milk and 75% soy milk

*** Consisted of 35 % Ground yellow corn, 34% wheat bran, 28% soybean meal and 3% Mineral and vitamin mixture

Table (2): Productive performance of lambs fed experimental diets during the first feeding period of the experiment

Items	G ₁	G ₂	G ₃
No. of lambs	5	5	5
Initial wt., kg	3.94	3.46	3.94
Final wt., kg	5.76 ^a ±0.1	5.19 ^b ±0.1	5.70 ^a ±0.1
Period, d	15	15	15
Total gain, kg	1.82±0.1	1.73±0.1	1.76±0.1
ADG, g.	121±6.4	115±5.9	117±6.0
Daily feed intake:			
DM, g	92 ^b ±5.3	116 ^a ±5.3	113 ^a ±5.3
CP, g	31.7 ^b ±3.1	43.3 ^a ±3.1	44.1 ^a ±3.1
Gain: intake ratio:			
gain: DMI	1.31 ^a	0.99 ^b	1.04 ^b
gain: CPI	3.82 ^a	2.66 ^b	2.65 ^b

Table (3): Average daily gain and mean DM and CP intakes and feed efficiency of lambs fed different experimental diets during the second feeding period.

Items	G ₁	G ₂	G ₃
No. of lambs	5	5	5
Initial wt., kg	5.76 ^a ±0.1	5.19 ^b ±0.1	5.70 ^a ±0.1
Final wt., kg	17.7±0.3	17.7±0.3	17.5±0.2
Period, d	99	100	84
Total gain, kg	11.9±0.3	12.5±0.3	11.8±0.2
ADG, g.	120±6.3	125±6.5	140±6.2
Daily feed intake: DM, g :			
from liquid diet	55 ^b ±1.8	74 ^a ±1.8	59 ^b ±1.8
from starter	414 ^a ±33	376 ^b ±33	398 ^{ab} ±33
Total DMI	469±33	450±33	457±33
CPI, g :			
from liquid diet	18.9 ^b ±0.7	27.6 ^a ±0.7	23.1 ^a ±0.7
from starter	87.3±14	79.3±14	83.9±14
Total CPI	106.2±14	106.9±14	107±14
Gain : intake ratio :			
gain : DMI	0.255 ^b	0.277 ^{ab}	0.306 ^a
gain : CPI	1.12 ^b	1.16 ^{ab}	1.31 ^a

Liquid plus solid feeding period:

During this period the starter was offered ad-libitum to lambs of the different groups at the beginning of this period (starting from the 3rd week of the experiment) with the same milk or a mixture of ewe's milk plus soymilk which offered during the first period, up to weaning.

The statistical analysis for total gain (Table, 3) showed that there was no significant difference among the experimental groups. Mean average daily gain for lambs of G₃ was slightly higher than those of G₁ and G₂, where it was 120, 125 and 140 g for G₁, G₂ and G₃, respectively. The periods to weaning for each group were differed according to the average daily gain of the experimental lambs, where the weaning weight was about 17 kg LBW. Lambs of G₃ attained the weaning weight in 84 days compared to 99 and 100 days for G₁ and G₂, respectively.

Data of Table (3) also, show that lambs of G₂ consumed significantly (P<0.05) the highest amount of daily DM from liquid diet (74±1.8 g). While lambs of G₁ and G₃ consumed 55 ±1.8 and 59±1.8 g/d. Contrary, the amount of daily DMI from the starter for lambs of G₂ was significantly (P<0.05) the lowest. This may due to that mixed ewe's milk with soymilk at the rate of 50 % was more palatable than the other diets. The daily DMI from the starter for different groups were 414±33, 376±33 and 398±33 g for G₁, G₂ and G₃, respectively. However, total daily DMI for the different groups were not significant (Table, 3) Likewise, there was significant difference (P < 0.05) in daily protein intake, CPI, from liquid diet between the lambs fed on ewe's milk, G₁, and the soymilk-fed groups (G₂ and G₃). The values of daily CPI from liquid diet were 18.9±0.7, 27.6±0.7 and 23.1±0.7 g for G₁, G₂ and G₃, respectively, being higher (P<0.05)

for soymilk-fed lambs by 46 and 22% for G₂ and G₃, respectively. Moreover, the differences among the groups for daily CPI from the starter were not significant (P > 0.05), where the values of starter CPI were 87.3±14, 79.3±14 and 83.9±14 g for G₁, G₂ and G₃, respectively. However, there was no significant difference (P > 0.05) among the experimental groups for total CPI (Table, 3).

Data of gain: feed ratio during the second period (liquid and solid feeding period) indicate that lambs fed 75% soymilk (G₃) were better than those fed ewe's milk (G₁) or 50% soymilk (G₂). The values of gain per unit of DMI were 0.255, 0.277 and 0.306 for G₁, G₂ and G₃, respectively. The corresponding values for CPI were 1.12, 1.16 and 1.31 for G₁, G₂ and G₃, respectively.

Dry matter and crude protein digestibilities:

Results of DM and CP digestibility are presented in Table (4). Digestion coefficient of DM and CP were significantly (P<0.05) higher for 75 % soymilk -fed lambs (G₃) than those of G₁ and G₂. Values of DM and CP digestibilities were 84.4, 82.6 and 88.6% and 87.5, 85.2 and 90.5% for G₁, G₂ and G₃, respectively).

During this period (liquid and solid feeding period) it could be noticed that feeding lambs on the mixture of ewe's milk with soymilk enhanced the lamb performance especially at the rate of 25:75 which improved (P>0.05) daily gain, (P <0.05) gain: feed ratio and dry matter and protein digestibility. In the same time, no death losses were recorded. This may due to that the enzyme system for these lambs was more adapted to utilize soymilk better than during the first period and or due to the highly proportion of protein of these diets on DM basis comparable to the ewe's

milk where protein represent 34.5, 37.4 and 39.1% of ewe's milk (calculated from Table,4), diet for G₂ and diet for G₃, respectively. The results of Hoffmann and Hoffmann (1981); Johnston (1997) and Meheus, *et al.* (2000) confirmed the results presented herein. They have shown that the partial replacement of dam's milk by processed soybean product resulted in improving lamb performance. Moreover, Nilsson (1999) reported that the use of soybean as a supplementary feed during the period from 15 to 50-60 days of age (which match the lamb ages of the present study) provides good results. Other workers have concluded that 50 % of the total protein in lamb milk replacer could be supplied by soybean protein concentrate (Gorrill and Nicholson, 1972 and Toullec, and Lalles (1996).

Lambs performance over the entire experimental period:

The data of this period was collected of the two experimental periods (liquid feeding period and liquid and solid feeding period), to estimate the performance of the experimental lambs over the entire experimental period.

Final body weights of lambs of the different groups (Table, 5) were nearly similar for the three groups due to that the weaning weight was determined to be about 17 kg. The values were 17.7, 17.7 and 17.5 kg for lambs of G₁, G₂ and G₃, respectively. Concerning the total gains for the different experimental groups, the statistical analysis showed no significant differences among the groups. The values of mean total gains were 13.7, 14.2 and 13.6 kg for lambs of G₁, G₂ and G₃, respectively. The values of average daily gain did not statistically differ, although the suckling periods were different. It is interest to note that ADG for lambs of G₃ was slightly higher than those of G₁ and G₂. These values were 121, 124 and 137

g for lambs of G₁, G₂ and G₃, respectively.

The results of Table (5) show that daily DMI from liquid diet was significantly ($P < 0.05$) higher for lambs fed 75% soymilk, G₃, than that of those on ewe's milk, G₁. The values were 147, 190 and 172 g for lambs of G₁, G₂ and G₃, respectively. Contrary, the amount of daily DMI from the starter was significantly ($P < 0.05$) higher for lambs of the control group (G₁) than that of G₂ which was fed on 50% soymilk. The values were 414, 376 and 398 g for lambs of G₁, G₂ and G₃, respectively. In the same time, the values of daily DMI for lambs of G₃ which was fed on 75% soymilk and 25% ewe's milk were in-between. However, there was no significant difference among the experimental groups for mean total DMI. Moreover, the results of Neary, *et al.* (1995); Beauchemin, *et al.* (1995) and Lanza, *et al.* (1999) confirm the results reported herein where they fed lambs on different milk replacers with deferent protein sources. They reported that, crude protein source had no effect on feed intake.

Concerning daily protein intake (CPI) from liquid diet, the highest ($P < 0.05$) consumption was recorded for lambs of G₂, while the lowest value was for lambs of G₁. However, no significant differences were detected among the values of daily CPI from the starter. Consequently, there were significant ($P < 0.05$) differences among the values of the daily total protein consumed (138, 150.3 and 151.1 g for lambs of G₁, G₂ and G₃, respectively)

Data concerning gain: intake ratio of different experimental groups during the entire experimental period (Table, 5) show that no significant difference among the groups either when expressed as DMI or by CPI. Where gain: DMI values were 0.215, 0.219 and 0.240 and

Table (4): Digestion coefficient of DM and CP of different experimental diets for experimental lambs.

Nutrients	G ₁	G ₂	G ₃
DM %	84.4 ^b	82.6 ^{ab}	88.6 ^a
CP %	87.5 ^b	85.2 ^{ab}	90.5 ^a

Table (5): Average daily gain and mean DM and CP intakes and feed efficiency of lambs fed different experimental diets during the entire experimental period.

Items	G ₁	G ₂	G ₃
No. of lambs	5	5	5
Initial wt., kg	3.94	3.46	3.94
Final wt., kg	17.7±0.3	17.7±0.3	17.5±0.2
Period, d	114	115	99
Total gain, kg	13.7±0.3	14.2±0.3	13.6±0.3
ADG, g.	121±5.2	124±5.5	137±5.1
Daily feed intake:			
DM, g :			
From liquid diet	147b	190a	172ab
From starter	414a	376b	398ab
Total DMI	561	566	570
CP, g :			
From liquid diet	50.7b	71.0a	67.2a
From starter	87.3	79.3	83.9
Total CPI	138 b	150.3 a	151.1 a
Gain : intake ratio :			
Gain : DMI	0.215	0.219	0.240
Gain : CPI	0.876	0.825	0.906

those for gain: CPI were 0.876, 0.825 and 0.906 for G₁, G₂ and G₃, respectively. The same results were obtained by Neary, *et al.* (1995); Beauchemin, *et al.* (1995) and Lanza, *et al.* (1999) by lambs fed different milk replacers with different protein sources. They reported that, crude protein source had no effect on feed gain ratio.

The results of this study indicate a slight decrease in body weight gains for soymilk-fed lambs at the beginning of the experiment due to the use of milk substitute with high levels (50 or 75%) for these animals. However, soymilk-fed lamb could compensate this losing during the second period. In addition, the palatability and dry matter and protein digestion were improved. Consequently, under the condition of the present study, it can be concluded that soymilk can be used successfully in rearing new-born lambs.

REFERENCES

- A. O. A. C. (1995). Official Methods of Analysis 15th ed. Association of Official Analytical Chemists. Washington, Virginia USA.
- Beauchemin, K.A.; L.A. McClelland; S.D.M. Jones and G. C. Kozub (1995). Effect of crude protein content, protein degradability and energy concentration of the diet on growth and carcass characteristics of market lambs fed high concentrate diets. *Can. J. Anim. Sci.* 75 (3): 387-395.
- Campos, O.F.; J.T. Huber; J.L. Morrill; R.K. Brownson; A.D. Dayton; H.J.S.Harrison and R.G.Warner. (1982). Spray-dried fish soluble or soy protein concentrate in milk replacer formulations. *J. Dairy Sci.*, 65:97.
- Cruywagen, C.W.(1990). Effect of curd forming of colostrum on absorption of immunoglobulin G in newborn calves. *J. Dairy Sci.*, 73:3287.
- Elliott, J.G.; T.J. Wagner and H.B. Geurin (1988). Performance of calf milk replacers based on milk protein, isolated soy protein /milk proteins or soy protein concentrate/milk proteins. *J. Dairy Sci.*, 71:125 (suppl.).
- Gorrill, A.D.L. and J.W. Thomas. (1967). Body weight changes, pancreas size and enzyme activity and proteolytic enzyme activity and protein digestion in intestinal contents from calves fed soybean and milk protein diets. *J. Nutr.* 92:215.
- Gorrill, A.D.L. and J.W.G. Nicholson (1972). Alkali treatment of soybean protein concentrate in milk replacers: its effects on digestion, nitrogen retention and growth of lambs. *Can. J. Anim. Sci.* 52: 665.
- Guilloteau, P.; R. Toullec; J.F. Grongnet; P. Patureau-Mirand, J. Prugnaud and D. Sauvant. (1986). Digestion of milk, fish and soy-bean protein in the pre ruminant calf: flow of digesta apparent digestibility at the end of the ileum and amino acid composition of ileal digesta. *Br. J. Nutri.* 55:571
- Havrevoll, Q.;N. Hadjipanayitou; M.R. Sanzampelayo; Z.N.itsan and P.Schmidely (1991). Milk feeding systems of young goats. *Nutr. Abst. And Rev.* 61:1876
- Hoffmann, H.U. and M. Hoffmann (1981). Suitability of different sources of protein in feeds for rearing lambs. *Archiv - fur -Tierzucht*, 24930:273.
- Jenkins, K.J., and D.B. Emmons (1979). Effect of fat dispersion method on performance of calves fed high fat milk replacer. *Can. J. Anim. Sci.* 59:713.
- Johnston, C. (1997). Less expensive milk replacers for lambs. *Special - Circular.* No.156 - 271.

- Lanza, M.; P. Pennisi and A. Priolo (1999). Faba bean as an alternative protein source in lamb diets: Effects on growth and meat quality. *Zootecnica-e-Nutrizione Animale*. 25 (2): 71-79.
- Lopes, J.N.P.; O.F.Campos; M.I. Leao and R.S.Liziere (1998).Effect of liquid diets based onwhole milk and, or, soybean by-products on some characteristics related to digestion in calves. *Revista-Brasileira -de ootecnia*. 27(3):603.
- Meheus, E.M.N.; W.G.C. Desadelear and M.E. Keij (2000).Calf milk replacer. Official Gazette of the United States Patent and Trademark Office. Aug. 1,1237 (1)No. Pagination.
- Mir, P, S.; J.H. Burton and J.G. Buchanan (1991). Nutritional performance of calves fed milk replacers containing processed soybean product. *Can. J. Anim. Sci.*, 71:97.
- Moutagne, L.; R.Toullec; J.P. Lalles; C. Fevrier; A. Aumaitre; F. Habe; T. Vares and M. Zjalic (2001).Influnce of dietary protein source on protin digestibility, flow and composition of endogenous protein losses in the pre-ruminant calf. Work shop on protein feed for animal production in Central and Eastern Europe, Rennes, France, 30 june – 1 July: 149.
- Neary, M.K.; M.J. Cecava and E.P. Berg (1995). Effect of fishmeal on growth and carcass traits of finishing lambs. *Sheep and Goat Research Journal* 11 (3): 106-110.
- Nilsson, J. (1999). Ewe milk substitutes and bottle reared lambs. *Farskotsel*. 78 (1): 12.
- Pinna, W.; V. Piccolo; P. Lai; A.Cappio-Borlino and Borlino-A. Cappio (1993). Production of milk lambs: comparison of maternal feeding and artificial rearing with acidified milk substitute.1- In vivo performance. *Risista-della-Societa-Italiana-di-Scienza-dellAlimentazione*. 22(4):501.
- Reddy, P.V.; J.L. Morrill and L.S. Bates. (1993). Effect of roasting temperature on soybean utilization by young dairy calves. *J. Dairy Sci.*, 76:1387.
- SAS (1998). Statistical analysis system. SAS User's Guide: Statistics, V.7.SAS Inst., Inc., ary, NC.
- Tanteeratarm, K.; A.I. Nelson and L.S. Wei (1992). INTOY/Food Science. Soymilk process. In "Soybean Processing for Food Uses".Tanteeratarm, K. (Eds). International Soybean Program, University of Illinois,Urbana.
- Toullec, R. and J.P. Lalles (1996). Digestion of protein substitutes by the veal calf. *Agrar for schung*. 3 (9): 427.

تأثير الإحلال الجزئى للبن النعاج بلبن الصويا على أداء الحملان حديثة الولادة

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يهدف هذا البحث إلى دراسة تأثير الإحلال الجزئى لبن النعاج بلبن فول الصويا على أداء الحملان الأوسمى الرضيعة. استخدم فى هذه الدراسة عدد ١٥ حمل، من كلا الجنسين، على عمر ٣-٤ يوم ووزن 0.1 ± 0.037 كجم. قسمت الحملان إلى ثلاث مجموعات (خمس بكل مجموعة). تغذت المجموعة الأولى لبن الأمهات و المجموعة الثانية و ٥٠% من لبن نعاج + ٥٠% لبن صويا. وتغذت الثالثة على ٢٥% لبن نعاج + ٧٥% لبن صويا.

قسمت فترة التجربة على فترتين غذائيتين، فترة التغذية السائلة (١٥ يوم) وفترة التغذية السائلة والجافة (من اليوم السادس عشر حتى القطام). وضعت جميع الحملان صناعيا بواسطة الزجاجات المزودة بالحلمات الكاوتشوك لحد الشبع. قُدم البادئ من اليوم السادس عشر بحرية أمام كل الحملان.

أظهرت نتائج الفترة الأولى أن الإحلال الجزئى للبن الصويا بدلا من لبن النعاج أدى الى انخفاض غير معنوي لمعدلات النمو و لزيادة معنوية من المادة الجافة المأكولة وكذلك أدى لانخفاض معنوي فى الكفاءة الغذائية. وفى المرحلة الثانية لم تظهر فروق معنوية فى الوزن النهائى أو الزيادة الوزنية بين المجموع الثلاثية. ولكن لوحظ زيادة معنوية فى المأكول من المادة الجافة من بديل اللبن المحتوى على لبن الصويا للمجموعتين الثانية و الثالثة مع انخفاض معنوي أيضاً فى كمية المادة الجافة من البادئ المأكول. كما أتضح أن التغذية على لبن الصويا على مستوى ٧٥% أدى الى تفوق الحملان فى قيم الكفاءة الغذائية و معدلات هضم المادة الجافة و البروتين.

وأظهرت نتائج الإجمالية للفترتين (من بدء التجربة و حتى القطام) أن الإحلال الجزئى للبن النعاج بلبن الصويا لم يؤثر معنويا على معدلات النمو و المأكول من المادة الجافة و الكفاءة الغذائية للحملان مما يسمح بالتوصية باستخدام لبن الصويا فى التنشئة الصناعية للحملان الرضيعة.