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EARLY WEANED RABBITS AS AFFECTED BY DIFFERENT LEVELS OF PROTEIN

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ABSTRACT

The performance of early weaned rabbits (at 16 days of age) fed on isoenergetic and isofiberotic diets with different levels of crude protein (20%, 18% and 16% respectively) were evaluated. A total of 60 (20/group) early weaned rabbits, 16 days old at the beginning of the experiment, were used for evaluating the growth performance, carcass characteristics at 23 and 30 days of age and apparent nutrient digestibility respectively. Rabbits fed on diets containing 20, 18 or 16% crude protein gained (from 16 to 30 days of age) an average of 422.4, 323.8 and 308.2 gm respectively. Corresponding feed conversion ratio was 1.10, 1.35, and 1.34. Dressing percentage for early weaned rabbit showed significant differences at 23 and 30 days of age. Rabbits fed 20% crude protein were significantly higher than the other two groups. Rabbits fed high level of protein (20%) showed the best nutrient digestibility for crude protein and ether extract. These results suggest that the starter diet with 20% crude protein can be better used by early weaned rabbits (16 days of age).

Keywords: Early weaned rabbits, crude protein, performance, carcass characteristics, digestibility coefficient.

INTRODUCTION

One of the major problems in rabbit nutrition is to meet the nutritional requirements of the animals, without creating digestive troubles that can lead to mortality (Gidenne, 1997). For this last aspect, the more critical period is around weaning (20-40 days of age) due to the transition from milk to solid nutrition and the development of cecal microbial activity that starts to stabilize only after 7 weeks of age. Di Meo et al (2004). According to Maertens and De Groote (1990) and Scapinello et al., (1999) an earlier intake of solid feed could improve the nutrition by stimulating the digestive enzymes and consequently reduce the post-weaning risk of digestive disorders. In this context due to early weaning, we make possible to give the young rabbits a specific diet which meet their nutritional requirements (Pascual *et al.*, 2001, Gidenne and Fortun- Lamothe, 2002). Early weaning around 21-25 days might improve the corporal of does and allow a specific nutrition of young rabbits around weaning time (Pascual *et al.*, 2001, Xiccato *et al.* 2000) in addition to reducing the lactation period and thus improving the female body condition as reported by Xiccato *et al.* (2004). However, mainly from a health point of view, nutritional needs of the young rabbits require to be more full known (Volek *et al.*, 2004).

Since little work has been published concerning weaned rabbits at early days, a development of methods and dietary sufficiency's for rearing kits weaned at 14-d are needed and might result in significant economic advantages. The objective of this study was to determine the effect of dietary protein level on growth performance of early weaned kits. At the same time to formulate a suitable diet (starter diet) for weaned kits at 16 days of age.

MATERIALS AND METHODS

The experimental work of the present study was carried out at Rabbits Production Unit (RPU), Poultry Production Department at Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

Weaning procedure:

A special technique describes by McNitt and Moody (1992) was used for kits weaning at 14 days of age. Weaned kits were induced to drink water and begin eating solid feed within a short period after being separated from the doe. The rabbit kits were placed in portable poultry brooder units (91*71*73* cm, for L, W and H) maintained at 35-40°C for 48 hrs to learn how to eat solid feed and drink tap water. On day 16, when kits start to eat and drink; they were moved to an open commercial style rabbitry at ambient temperature and distributed into groups and sub groups to receive the experimental diets for 14 days later. They were housed in galvanized, metal wire cages, each with dimensions of 100*80*45 cm for length, width, and height, respectively and fed the experimental diets. The brooder unit used for early weaning kits is shown in figure (1 and 2).

Experimental rabbits and their management:

A total of sixty unsexed NZW rabbit kits removed from the brooder at 16 days of age were used in this experiment. Rabbits were marked and randomly assigned to 3 treatment groups, 12 rabbits each according to a randomized completely –block design. Each group (treatment) was divided into four replicates of three rabbits each. The experimental rabbits were housed in a naturally ventilated and lightening building and kept under the same managerial and hygienic conditions. All diets are offered *ad lib* in a pellet form and normal tap water was provided with automatic nipple system. Rabbits were individually weighed at the beginning of the experiment, then at weekly intervals until the end of the experiment. Daily weight gain, daily feed consumption, feed conversion ratio and mortality rate were recorded. The feeding trial was continued for 14 days.

Experimental Rations:

Three isocaloric and isofiberous experimental diets with three different CP levels (16, 18 and 20%) were formulated to study the effect of dietary CP level on growth performance of early weaned rabbits. The composition of experimental diets along with their chemical analysis is presented in table 1.

Digestibility Trial:

At 30 days of age, digestibility trial was conducted using 12 rabbits (four rabbits from each treatment group), which were housed individually in metabolism cages that allow feces and urine separation. The preliminary period continued for 3 days and the collection period extended for 5 days. Feed intake was exactly determined. Feces were collected daily, weighted and dried at 60-70°C for 24 hrs, bulked, finely ground and stored for chemical analysis. The apparent digestibility coefficients of DM, OM, CP, CF, EE and NFE for the experimental diets were estimated.

Table (1): Composition and chemical analysis of the experimental rations:

Ingredient %	Diet (20 % CP)	Diet (18 % CP)	Diet (16% cp)
Clover hay	41	41	41
Wheat bran	17	17	17
Soy beans (44%)	26.4	21.4	15.4
Corn	12	17	23
Lime stone	0.3	0.3	3
Molasses	2	2	2
Salt (NaCl)	0.5	0.5	0.5
Vitamins & minerals*	0.3	0.3	0.3
Dicalcium phosphate	0.5	0.5	o.5
Total	100	100	100
Calculated analysis			
DE (Kcal/kg)	2565	2582	2603
Crude protein %	20.2	18.22	16.4
Crude fiber %	14.4	14.2	14.1
Ether extract %	2.2	2.2	1.8
P%	58.2	58.2	58.2
Ca%	0.8	0.8	0.8
Chemical analysis %			
Crude protein	20.1	17.92	16.2
Crude fiber	14.4	14.4	14.2
Ether extract	2.2	2.2	2.2
NFE	48.2	50.1	52.1
P	0.5	0.5	0.5
Ca	0.8	0.8	0.8

*** Each 3 kg. contains: Vit.A 12000000 IU; Vit.D_3 2000000IU; Vit.E 10000 mg; Vit.K_3 2000 mg; Vit.$B_1$1000 mg; Vit.B_2 5000 mg; Vit.B_6 1500 mg; Vit.B_{12} 10 mg; Biotin 50 mg; Coline chloride 250000 mg; Pantothenic acid 10000 mg; Nicotinic acid 30000 mg; Folic acid 1000 mg; Manganese 60000 mg; Zinc 50000 mg; Iron 30000 mg; Copper 10000 mg; Iodine 1000 mg; Selenium 100 mg; Cobalt 100mg and $CaCO_3$ to 3000 g.**

Carcass Characteristics:

At 23 and 30 days of age, four randomly chosen rabbits representing each group were slaughtered according to standard technique of Lukefahr *et al.* (1992). Dressing percentage was estimated as carcass weight relatively to pre-slaughter body weight. Relative weights of liver kidney, heart, spleen, head and Gastro intestinal tract (weight, PH and length) were recorded.

Chemical analysis:

Samples of the experimental diets and feces were analyzed to determine the dry matter (DM), crude protein (CP), ashes, ether extract (EE) and crude fiber (CF) following the AOAC (1990) methodology.

Statistical analysis:

Data were analyzed according to statistical analysis system User's Guide, (SAS, 1995). The statistical model used due to one way classifications for all parameters was as follows:

$Yij = \mu + Ti + eij$

Where:

Yij = the observation on the I^{th} treatment.

μ = Overall mean.

Ti = effect of I^{th} treatment.

eij = random error treatment.

Separation among means was carried out using Duncan's multiple range test (Duncan, 1995).

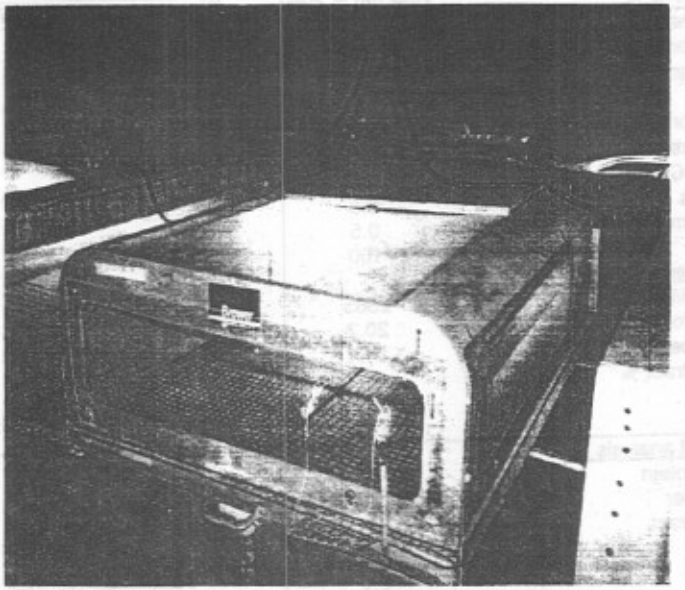

Fig (1): Brooder as described by McNitt and Moody, 1992

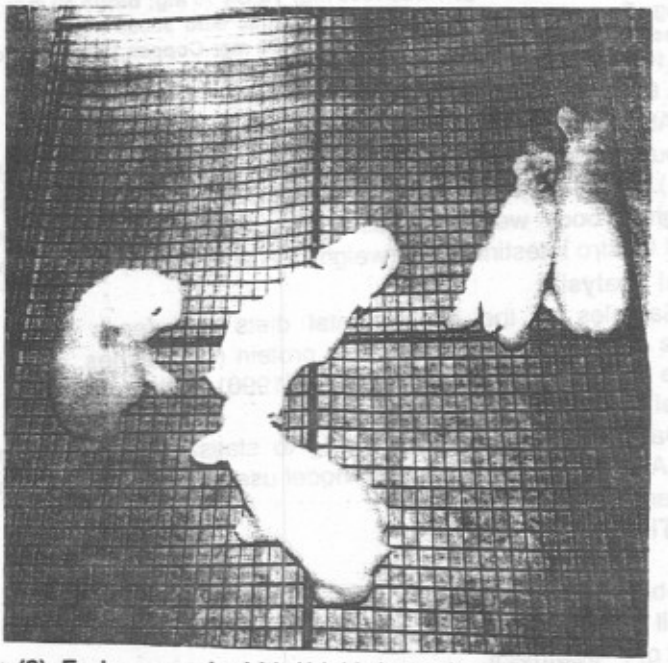

Fig (2): Early weaned rabbit (14-16 days of age) in the brooder

RESULTS AND DISCUSSION

On the 23 days of age (7 days after weaning) there were significant differences in the performance trait. Rabbits fed diet containing 20% crude protein recorded the highest live body weight and body weight gain followed by those fed 18% CP or 16% CP respectively. Rabbit fed 20% CP recorded the highest ($p<0.01$) feed intake and best feed conversion ration.

Between 23 and 30 days of age, rabbit fed on 20% CP diet tend to gain better by 1.4 % and showed 0.8% more efficiency in feed utilization than the other two groups. These results indicated that during the whole fattening period from 16 to 30 days of age, the advantages effect of high level of protein appeared, Namely, rabbits fed 20% CP diet had heavier body weight gain by 1.3% and 1.37% compared to groups fed on 16% or 18% CP respectively. Beside a significant feed intake, the feed utilization was more efficient in group fed 20% crude protein than in the other two groups. No mortality was recorded whatever the group. This may be due to rabbit response to the protein intake or that the ingredient used in the formulation of the experimental diet were more suitable for this age or the system of weaning used in this study was easy for practical application. These observations confirmed by Volek *et al.* (2004) who reported that one of the main problems in formulating starter diets is finding suitable sources and levels of nutritional requirements. Nicodemus *et al.* (2004) reported that mortality rate during pre- and post-weaning periods are mostly diet dependent. These results confirm also that rabbit, after the first period of weaning, is well adapted to diets and can modules their feed intake according to nutritive requirements.

The differences ($P<0.05$) in solid feed intake between the groups could mean that early weaning rabbits regulate intake according to the chemical characteristics (especially protein content) of the administered diet. Gidenni *et al.* (2004) stated that young rabbits did not entirely regulate their feed intake according to dietary energy content. Similar conclusion was reported by Fortun-Lamothe *et al.* (2001) and Debray *et al.* (2002). The improvement in growth performance of early weaned rabbits fed diet containing 20% CP may be due to reduced stress during this delicate period of young rabbits' life that allowed more regular feed intake. Also, data given in Table (2) for body weigh at gain and feed conversion efficiency are in accordance with Nicodemus *et al.* (2004) who reported that 292 gm average weight of kits at 17days of age for the rabbits caged separately of the rabbits does but suckling once a day and received solid feed in their cages. Gidenne *et al.* (2004) reported that the average weight for early weaned rabbits were 320 gm at 31 day of age. In a recent study daily feed intake was 24.5 g and the average feed conversion was 0.86 with 4.8% health risk index for early weaned rabbits (at 18 days of age) and fed on diet containing 19.5% CP and high level of digestible energy (12.89 MJ/Kg) (Gidenne and Fortum –lamothe, 2004). They added that live weight of rabbits weaned at 23 days of age was 390gm; their final weight was 693gm at 32days of age, while the FCR were 360/303 with 1.8 mortality rates.

Table (2):- Effect of feeding different levels of CP on early weaned rabbit performance.

Items	Level of protein %			Sign. of Diff.
	20%	18%	16%	
Live weight (gm):				
at 16days	206.9 ± 6.7	204.9 ± 3.7	195.5 ± 3.4	N.S.
at 23 days	353.1 ± 7.5^{a}	326.0 ± 7.2^{b}	304.8 ± 6.4^{c}	*
at 30 days	623.87 ±10.3^{a}	527.1 ± 8.0^{b}	506.0 ± 9.2^{b}	*
Body weight gain: (16-23 d old)				
Weight gain	147 ± 5.3^{a}	121.0 ± 8.5^{b}	108.5 ± 4.7^{b}	*
Feed intake	153.5 ± 5.3^{a}	138.4 ± 3.6^{b}	149.1 ± 3.6^{a}	*
Feed conversion	1.0 ± 0.03^{c}	1.22 ± 0.06^{b}	141.1±0.05^{a}	*
Second growth (23-30 d old)				
Weight gain	279.4 ± 9.8^{a}	199.9 ± 9.4^{b}	197.2 ± 5.6^{b}	*
Feed intake	312.2 ± 11.1^{a}	296.0 ±12.2^{ab}	164.6±10.0^{b}	*
Feed conversion	1.12 ± 0.02^{c}	1.52 ± 0.07^{a}	1.34 ± 0.03^{b}	*
Overall period (16-30 days)				
Weight gain	422.4 ± 10.2^{a}	323.8 ± 9.2^{b}	308.2 ± 7.0^{b}	*
Feed intake	465.3 ± 11.7^{a}	437.4 ±12.5^{ab}	414.8 ± 8.4^{a}	*
Feed conversion	1.10 ± 0.01^{b}	1.35 ± 0.04^{a}	1.34 ± 0.01^{a}	*

a, b and c means ± SE. within row with different subscript are significantly different (P,0.05)

Data in Table (3) shows carcass characteristics of the early wined kits fed on diet containing different levels of protein. On the day 23 of age, dressing percentage improved significantly (P<0.05) for rabbits received 20% crude protein compared to those fed on 18 or 16% CP diets. However, the differences between kits fed 18 or 16% CP diets were in significant. On the day 30 of age (table 4) rabbits fed on diet containing 20% CP recorded high (P<0.05) dressing percentage followed by those received 18% or 16% protein. On the other hand, the differences among groups fed on 18 or 16% CP were significant (P<0.05). The rest of carcass parameters (liver, kidney, heart and elementary tract weight percent) showed non significant differences. Data of Kovages *et al.* (2004) showed that liver % recorded 3.6% at 21days of age and 4% at 28 days of age where Kidneys Heart + Lungs% were 2.7 and 2.2 at 21 and 28 days of age respectively. Also total gastro intestinal tract were 6.7 and 10.1% at 21 and 28 day of age respectively. The absence of substantial differences of stomach cecaum and colon characteristics according to different protein level is due to keep feed intake regular and caecal fermentation under control. The same conclusion reported by Di Meo *et al.* (2004).

Early weaned rabbits fed 20% CP reported better utilization (P<0.01) of DM, OM, CP, and EE respectively while the differences in digestibility coefficient of CF and NFE were non-significant in all groups (table 5). Other wise rabbits fed on diet containing 18% crude protein digest CP and EE more efficient (P<0.01) than those fed 16% CP diet. These results may suggest an earlier maturation of the digestive capacity for the protein level in the diet. These results are in accordance with Cameron *et al.* (1991) and Lui *et al.* (2004), the crude protein digestibility increases with the crude protein content in feed. Gallios *et al.* (2003) reported that an early weaning affects the

digestive development of the young rabbit, and would subsequently modify its digestion.

Table (3):-Effect of feeding different levels of protein on carcass characteristics of growing rabbits at 23d of age.

Items	Level of protein %			Sig. of diff.
	20%	18%	16%	
LBW (gm)	360±30	322±25	308±25	NS
Dressing (%)	33.4±1.0	31.6±1.0	31.5±1.5	*
Scarified blood (WT %)	3.4±0.1	3.2±0.1	3.2±0.1	NS
Fur (WT %)	11.3±0.5	10.3± 0.4	10.8±0.6	NS
Head (WT %)	10.0±0.2	9.7± 0.2	10.4±0.3	NS
Liver (WT %)	3.5±0.4	3.5± 0.3	3.6±0.4	NS
Heart (WT %)	0.4±0.01	0.4± 0.01	0.3±0.02	NS
Spleen (WT %)	0.1± 0.01	0.1± 0.01	0.09±0.01	NS
Lungs (WT %)	0.9± 0.1	0.8± 0.1	0.8±0.02	NS
Kidney (WT %)	1.3± 0.2	1.2± 0.1	1.2±0.1	NS
Stomach:				
Empty (%)	1.8± 0.9	1.7±0.9	1.9±0.7	NS
PH	3.37±0.6	2.2±0.4	2.17±0.2	*
Ceacum:				
Empty (%)	2.3±0.1	2.3±0.2	2.1±0.2	NS
Length (cm)	21.6±0.4	21.0±0.6	19.8±0.4	NS
PH	5.8±0.4	6.0±0.2	6.8±0.2	*
Colon:				
Empty (%)	0.1±0.0	0.1±0.0	0.01±0.0	NS
Length (cm)	4.1±0.1	4.07±0.1	3.97±0.2	NS

a, b and c means ± SE. within row with different subscript are significantly different (P,0.05).

Table (4):- Effect of feeding different levels of protein on carcass characteristics of growing rabbits at 30d of age.

Items	Level of protein %			Sign. of diff.
	20%	18%	16%	
LBW (gm)	640±16.4	530±22.6	508±15.4	*
Dressing (%)	38.9±1.3	34.8±1.2	34.0±1.2	*
Scarified blood (WT %)	3.8±0.1	3.5±0.1	3.2±0.2	NS
Fur (WT %)	10.7±0.3	11.1±0.6	10.8±5.1	NS
Head (WT %)	7.3±0.8	7.6±0.6	8.6±0.6	NS
Liver (WT %)	3.4±0.06	3.2±0.03	3.3±0.08	NS
Heart (WT %)	0.37±0.02	0.34±0.02	0.37±0.02	NS
Spleen (WT %)	0.10±0.004	0.09±0.004	0.13±0.006	NS
Lungs (WT %)	0.68±0.02	0.63±0.03	0.63±0.02	NS
Kidney (WT %)	1.06±0.02	1.13±0.02	0.95±0.02	NS
Stomach:				
Empty (%)	1.6±0.1	2.14±0.2	1.8±0.1	NS
PH	1.5±0.1	1.6±0.1	1.5±0.2	NS
Ceacum:				
Empty (%)	2.0±0.04	2.5±0.05	2.5±0.08	NS
Length (cm)	26.4±0.07	27.2±0.03	25.6±0.09	NS
PH	5.5±0.1	5.9±0.2	6.3±0.1	*
Colon:				
Empty (%)	0.22±0.02	0.21±0.03	0.21±0.03	NS
Length (cm)	7.2±0.02	6.6±0.01	5.8±0.01	*

a, b and c means ± SE. within row with different subscript are significantly different (P,0.05).

In calculation, early weaned kits at 14-d could be maintained on a diet with 20% CP without any harmful effect on health or growth performance.

Table (5) : Apparent digestibility coefficient of nutrients at 30d of age.

Items	Level of protein %			Sign. of diff.
	20%	18%	16%	
OM	54.6 ±0.66 [a]	51.16 ± 0.60 [b]	49.3 ± 0.47 [b]	*
CP	70.70 ± 0.75 [a]	65.2 ± 0.30 [b]	61.0 ±0.11 [c]	*
CF	17.2 ± 0.24 [a]	74.6 ± 0.45 [a]	71.3 ± 0.24 [a]	*
EE	82.2 ± 0.24 [a]	74.6 ± 0.48 [b]	71.3 ± 0.24 [c]	*
NFC	66.4 ± 0.17 [a]	64.9 ± 0.8 [b]	64.73 ± 0.6 [b]	*

a, b and c means ± SE. within row with different subscript are significantly different (P,0.05).

REFERENCES

A.O.A.C. (1990). Official Methods of Analysis. 15th Edition Association of Official Analytical chemists. Washington d.C.

Cameron, M. R.; Klusmeyer, T. H. and Lynch, G. L.1991. Effects of urea and starch on rumen fermentation, nutrient passage to the duodenum, and performance of cows. Journal of Dairy Science, 74:1321-1336.

Duncan. D.B. (1955). Multiple range and multiple F-test. Biometrics, 11 : 1-42.

Debray L., Fortun-Lamothe L. and GIDENNE T., 2002. Influence of low dietary starch/fiber ratio around weaning on intake behavior, performance and health status of young and rabbit does. Anim. Res., 51: 63-75.

Di Meo C., Stanco G., Piccolo G., Taranto S., Gazaneo A M.P., and Nizza A. 2003. Productive performance of rabbits according to pre-weaning solid feed and milk intake. Italian J. Anim. Sci., 2: 51-58.

Di Meo C, Bovera F, Piccolo G, Gazaneo A.M .P, and Nizza A (2004). Effect of pre-weaning diet on rabbit performance. 8th World Congress, Puebla, Mexico, 7-10th of September: 792-798.

Fortum-Lamthe L., Gidenne T., Chalaye F., and Debery L., 2001. Feeding strategy around weaning: effects of dietary starch/fibers ratio. *9ème J. Rech. Cunicoles Fr.*, 28-29 nov., *Paris, Ed. Par G. Bolet, ITAVI pupl., pp* 195-198.

Gallios M., Gidenne T., and Fortum-Lamthe L., 2003 Sevrage précoce des lapereaux : conséquences sur le développement de l'appareil digestif en relation avec les performances zootechniques. 10ème J. Rech. Cunicoles Fr., 19-20 nov. 2003, Paris, Ed. par G. Bolet, ITAVI publ., pp.127-130.

Gidenne T. 1997. Caeco-colic digestion in the growing rabbit: impact of nutritional factors and related disturbances. Livest. Prod. Sci. 51: 73-88.

Gidenne T., and Fortum-Lamthe L. 2002. Feeding strategy for young rabbits around weaning: a review of digestive capacity and nutritional needs. Anim. Sci. 75:169 -184.

Gidenne T., and Fortum-Lamthe L (2004). Growth health status and digestion of rabbits weaned at 23 or32 days of age. 8th world rabbit congress, Puebla, Mexico, 7-10th of September : 846-852.

Gidenne T., Lapanouse A., and Fortum-Lamthe L (2004). Feeding strategy the early weaned rabbit: interest of a high energy and protein starter diet on cross and health status. 8th world rabbit congress, Puebla, Mexico, 7-10th of September :853-860

Kovages M.1, Szendr. ZS,Csutor.S I, B.TA B, Febel H, K.SA E, Bencsne K. Z, and Szak.CS, Horn P (2004). Some digestive physiological parameters of early weaned rabbits fed non-medicated diets. 8th world rabbit congress, Puebla, Mexico, 7-10th of September : 1067-1102.

Lukefahr, S. D.; Van Vleck, L. D. and Roberts, J. D., (1992). Estimates of components of variance and covariance of carcass traits in rabbits using animal model. *Journal of Applied Rabbit Research*, 15:259-273.

Lui J. F, Andrade B. R. P, Oliveira M. C, Arantes U. M, Cancherini L. C, and Caires D. R (2004). Nutritive value of diets containing alfalfa hay and whole corn plant to growing rabbits. 8th world rabbit congress, Puebla, Mexico, 7-10th of September : 897-901.

McNitt, J.I and G.I. Moody (1992). A method for weaning rabbits at 14 days. J. Appl. Rabbit. Res. 15: 661-665.

Maertens L., and De Groote G. 1990. Feed intake of rabbit kit before weaning and attempts to increase it. J. Appl. Rabbit Res. 13: 151-158 .

Nicodemus N.,Perez-Alba L.,Carabano R., De Blas C., Badioka I., and Perez De Rozas A., Garcia J (2004). . Effect of level of fiber and level of ground of fiber sources on digestion and ileal and caecal characterization of micro biota of early weaned rabbits. 8th world rabbit congress, Puebla, Mexico, 7-10th of September : 928-1001.

Pascual J.J., Cervera C., and Fern.Ndez-Carmona J. 2001. Effect of solid food intake before weaning on the performance of growing rabbits. Proc. 2nd Meeting of workgroup 3 and 4 COST Action 848. Godollo, Hungary, 48-49.

SAS Institute (1996). SAS/ STAT user's Guides statistics, ver. 6.04, fourth Edition, SAS Institute, Inc., Carry. NC.

Scapinello, C., Gidenne, T., and Fortum-Lamthe, L. 1999. Digestive capacity of the rabbit during the post-weaning period, according to the milk/solid feed intake pattern before weaning. Reprod .Nutr. Develop. 39: 423-432.

Volek Z., Skrivanova V., Marounek M., and Zita L., (2004). Replacement of starch by pectin and chicory inulin in the starter diet of early weaned rabbits: effect on growth, healthy status, caecal traits and viscosity of the small intestinal content. 8th world rabbit congress, Puebla, Mexico, 7-10th of September : 1022-1028.

Xiccato G., Trocino A., Sartori A., and Queaque P.I., 2004. Effect of parity order and litter weaning age on the performance and body energy balance of rabbit does. Livest. Prod. Sci. 85: 239-251.

Xiccato G., Trocino A., Sartori A., and Queaque P.I., 2000. Early weaning of rabbits: effect of age and diet on weaning and post-weaning performance. 7th World Rabbit Congress, World Rabbit Sci., 8: suppl.1, vol. C, 483-490.

تأثيير المستويات المختلفة من البرونين على الارانب المفطومة مبكراً

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أجريت هذه التجربة بهدف دراسة تأثيير تغذية الأرانب المفطومة مبكراً في عمر ١٦ يوم على علائق مختلفة في محتواها من البروتين الخام (٢٠ و ١٨ و١٦%).
وقد استخدم ستون أرنب مفطوم مبكراً على عمر ١٦ يوم وتم تقسيمها إلى ٣ مجموعات (٢٠ أرنب لكل مجموعة) لدراسة معدلات النمو وصفات الذبيحة على عمر ٢٣ و٣٠ يوم من الولادة عـلاوة على تقدير معاملات الهضم عند اليوم الثلاثون من العمر.
وقد أوضحت النتائج الأتي:-

١. الأرانب مبكرة الفطام والمغذاه على علائق تحتوي على ٢٠ و ١٨ و ١٦ % بروتين خام
أ. قد اكتسبت اوزان ٤٢٢,٤ و٣٢٣,٨ و ٣٠٨,٢ جم في الفترة من ١٦ إلى ٣٠ يـوم مـن العمر.
ب. معاملات التحويل الغذائي كانت ١,١ و ١,٣٥ و ١,٣٤ على التوالي.
٢. الارانب المغذاه على علائق تحتوي على ٢٠% بروتين خام قد اظهرت أعلى معـدلات فـي نسب التصافي على عمر ٢٣ و ٣٠ يوم.
٣. تفوقت الأرانب المغذاه على ٢٠% بروتين خام في معاملات هضم البروتين.

يمكن الاستنتاج من هذه النتائج أنه يمكن تغذية الأرانب المفطومة مبكراً على عمر ١٦ يوم على علائق تحتوي على ٢٠% بروتين خام وحتى عمر ٣٠ يوم.