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NEW ZEALAND WHITE RABBIT DOES AND THEIR GROWING OFFSPRINGS AS AFFECTED BY DIETS CONTAINING DIFFERENT PROTEIN LEVEL WITH OR WITHOUT LACTO-SACC SUPPLEMENTATION

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ABSTRACT : Forty New Zealand White rabbit does and their 456 (133 males and 233 females) 28 day old weaned offsprings were used in this investigation to study the effects of diets containing different protein levels with (0.1%) or without Lacto-Sacc supplementation on their reproductive and productive performance. Rabbit does fed normal protein (18.4%) diet 4 recorded significantly higher litter size and weight at weaning (P<0.05) and total milk yield (P<0.01) than those fed low protein level (16.3%) and supplementation doe diets with 0.1% Lacto-Sacc increased significantly litter size and weight at 21 and 28 day (P<0.05) and total milk yield (P<0.01). The interaction effects between dietary protein and Lacto-Sacc on litter size and weight and total milk yield were not significant. In offsprings, diets containing the normal protein level (16.3%) showed significantly (P<0.01) higher values of post-weaning litter weight at 8 and 12 weeks and daily gain at 4-4, 8-12 and 4-12 weeks of age and also Lacto-Sacc addition gave significantly (P<0.05) higher values in body weight at 12 weeks and daily gain at 8-12 and 4-12 weeks of age, than in those fed diets containing low protein level (14.8%) and without Lacto-Sacc supplementation, respectively. The male rabbits were significantly (P<0.01) higher than females in litter body weight and gain. Interaction between dietary protein and Lacto-Sacc addition showed highly significant effects (P<0.01) on final body weight at 12 weeks and daily gain at 8-12 and 4-12 weeks of age in offsprings. Lacto-Sacc effect was apparent with the normal protein level than with the low level. The interaction effects between sex and Lacto-Sacc supplementation were highly significant on final body weight and daily gain at 4-8, 8-12 and4-12 weeks of age. Male rabbits seemed to be more affected than females by Lacto-Sacc supplementation. Feed conversion and the margin were improved with increasing dietary protein and addition of Lacto-Sacc. Analysis of covariance of carcass and non-carcass components relatively to live body weight at slaughter did not show any significant effects for the factors studied.

RESUME : Performances de lapines et de leurs produits nourris avec des aliments ayant divers taux de proteines, supplémentés ou non par du Lacto-Sacc
Quarante lapines reproductrices Néo-Zélandais Blanc et leurs lapereaux sevrés à 28 jours (233 mâles et 223 femelles) ont été utilisés pour étudier l'influence combinée de 2 taux de protéines alimentaires et de 2 niveaux de supplémentation par du Lact-Sacc (0% et 0.1%). Chez les lapines (2 à 4 portées par femelle), le taux de protéines alimentaires le plus élevé (18.4% vs 16.3%) permet une production laitière et un poids de portée au sevrage significativement plus élevés (96.5 vs 79.2 g/lapine/jour et 1886 vs 1195 g respectivement). La supplémentation par le Lacto-Sacc permet un accroissement de la taille de la portée à 21 jours comme au sevrage (4.60 vs 3.75 lapereaux/portée) ainsi qu'un accroissement de la production laitière (+14%) et du poids de portée au sevrage (+20%). Aucune des interactions entre supplémentation et taux protéique, n'est significative. Chez les lapereaux, la croissance post-sevrage a été suivie entre les âges de 4 et 12 semaines. L'aliment contenant le plus de protéines (16,3% vs 14,6%) a permis une croissance significativement meilleure durant tout l'engraissement (22,4 vs 18,8 g/jour). La supplémentation par le Lacto-Sacc a également permis une augmentation significative de la croissance de 5.5%. Par ailleurs, les mâles ont eu une croissance significativement plus élevée que les femelles (+8,6%) alors que les poids au sevrage n'étaient pas significativement différents (438 et 420 g respectivement). Pour la vitesse de croissance, l'interaction entre le taux de protéines et la supplémentation est significative en raison d'un effet du Lacto-Sacc ne se manifestant qu'avec le taux de protéines le plus élevé. Il y a également une interaction significative entre le sexe et la présence du Lacto-Sacc, correspondant à un effet significatif chez les mâles exclusivement. L'indice de consommation est nettement plus faible avec le taux de protéines le plus élevé (3.93 vs 5.19), et un peu réduit par la présence de Lacto-Sacc (4.34 vs 4.65). L'analyse des performances à l'abattage utilisant le poids à l'abattage comme covariable n'a montré aucun effet du type d'aliment sur le rendement à l'abattage ni sur le poids du foie ou des reins.

INTRODUCTION

Recently an increasing number of feed additives are used in rabbit production. The usefulness of such products depends on the specific nutrient requirements of the animal, the nature of the feed material, management practices, health and physiological status of the animal and the economic returns associated with the use of the supplement.

Probiotics are dietary supplements containing live or revived beneficial micro-organisms. Their mode of action is generally ascribed to their ability to stimulate the digestion process and/or to contribute to the microbial equilibrium of the gut in order to prevent digestive disorders and/or to increase zootechnical performance. The studies on the use of Lacto-Sacc as probiotic supplement in rabbit rations with different protein levels under Egyptian sub-tropical conditions, are lacking.

The objectives of the present work were to study the effects of Lacto-Sacc inclusion in diets with different protein levels on reproductive and productive performance of New Zealand White rabbits, under Egyptian sub-tropical conditions.

MATERIALS AND METHODS

The experimental work was carried out in private farm in Sharkia Governorate, Egypt, using 40 New Zealand White rabbits odes and their 456 (233 males and 233 females) 28 day old weaned offsprings. The does were randomly allotted to four groups of 10 does each, of which two groups were fed o low protein diet (Diet 1) containing 16.3% crude protein, 13.2% crude fibre and 2665 kcal digestible energy (DE)/kg diet. The other two groups were fed a normal protein diet (Diet 2) containing 18.4% crude protein, 13.1% crude fibre and 2670 kcal DE/kg diet (Table 1). One of each dietary protein level was supplemented Lacto-Sacc at 0.1% (1g/kg diet) before the pelleting. The young rabbits born from does fed low dietary protein level were fed a diet (Diet 3) containing 14.6% crude protein, 13.2% crude fibre and 2665 kcal DE/kg diet, while those born from does fed normal protein diet were fed a diet (Diet 1) containing 16.3% crude protein, 13.2% crude fibre and 2665 kcal digestible energy (DE)/kg diet (Table 1). Young rabbits born from does fed diets supplemented with Lacto-Sacc were fed diets supplemented with the same level of Lacto-Sacc (0.1%).

Table 1 : Composition and chemical analysis of the experimental diets.

Items	Diets 1	2	2
Ingredients			
Alfalfa hay	30.0	32.0	30.0
Corn	24.0	20.0	27.0
Soybean meal	13.0	19.0	10.0
Wheat bran	28.0	24.0	28.0
Molasses	3.0	3.0	3.0
Limestone	1.4	1.4	1.4
Sodium chloride salt	0.3	0.3	0.3
Vitamin and mineral premix	0.3	0.3	0.3
Chemical composition			
Crude protein %	16.3	18.4	14.6
Crude fibre %	13.2	13.1	13.2
Digestible energy (kcal/kg)*	2668	2670	2665

* Calculated according to NRC (1977)

Numbers of young rabbits used in the study were 51 males and 51 females offsprings of the group that fed low protein diets without Lacto-Sacc addition, 54 males and 54 females offsprings of the group that fed low protein diet with Lacto-Sacc, 73 males and 71 females offsprings of the group that fed high protein diet without Lacto-Sacc, and 55 males and 47 females offsprings of the group that fed high protein level diet with Lacto-Sacc addition.

The does were kept individually into breeding cages which were provided with nest boxes for kindling and nursing, automatic nipples for drinking fresh water and feeders. Matings was carried out from October (1992) to March (1993), by transferring each doe to buck's cage, then returned to its cage after mating. Females were presented to the male three days after parturition. Young does were firstly mated at around 23 weeks of age. Abdominal palpation was employed ten days after service for pregnancy diagnosis and the does failed to conceive were returned to the same buck until pregnancy was achieved. The number of parities for each doe ranged between 2 to 4. Milk yield was estimated every day by the difference between the weight of the doe before and after suckling that occurred once a day. The young rabbits were housed in batteries provided with automatic nipples for drinking clear fresh water and feeders. Weaned rabbits were weighed biweekly and feed consumption was calculated for all the growing rabbit groups. At the end of the growing period, 10 rabbits (5 males and 5 females) from each group were randomly taken for slaughter after being fasted for 12 hours. After complete bleeding, the carcass and some non carcass components, were weighed. All rabbits were kept under the same managerial and hygienic conditions.

The data of litter size, weight and gain and milk yield were analyzed according to SNEDECOR and COCHRAN (1982) by using the following model :

$Y_{ijk} = \mu + P_i + L_j + PL_{ij} + e_{ijk}$ (1) where

μ = the overall mean,

P_i = the fixed effect of i[th] dietary protein level (i = 1, 2...),

L_j = the fixed effect of j[th] dietary Lacto-Sacc supplementation (j = 1, 2...),

Pl_{ij} = the interaction between the i[th] dietary protein level and Lacto-Sacc level

e_{ijk} = random error.

The data of post-weaning rabbit body weight and gain was analysed using the following model :

$Y_{ijkl} = \mu + P_i + L_j + S_k + PL_{ij} + PS_{ik} + LS_{jk} + PLS_{ijk} + e_{ijkl}$ (2) where :

μ, P_i, L_j, PL_{ij} and e_{ijkl} as mentioned in model 1,

S_k = the effect of k[th] sex (k = 1, 2...),

PS_{ik} = the interaction between the i[th] dietary protein level and sex,

Table 2 : Pre-weaning doe performance (litter size and weight) of New Zealand White doe rabbits as affected by protein level, Lacto-Sacc supplementation and their interaction.

	Litter size			Litter weight (g)			Litter gain	Average milk Yield
	At birth	21-day	28-day	At birth	21-day	28-day	(g/day/litter)	(g/day/doe)
Protein level								
Low protein (16.3% ; LP)	5.72±0.28	4.12±0.29	4.00±0.29	320.3±15.1	1195±74	1570±103	12.0±0.7	79.2±3.3
Normal protein (18.4% ; NP)	6.11±0.29	4.42±0.31	4.34±0.31	343.0±15.4	1391±95	1886±128	12.6±0.8	96.5±2.4
Significance	NS	NS	NS	NS	NS	*	NS	**
Lacto-Sacc addition								
Unsupplemented (0.0% ; LS0)	5.74±0.29	3.86±0.30	3.75±0.29	316.1±14.8	1181±84	1570±116	11.7±0.7	81.6±3.1
Supplemented (0.1% ; LS1)	6.08±0.29	4.69±0.30	4.60±0.30	347.3±15.7	1403±83	1883±114	12.9±0.6	93.4±3.3
Significance	NS	*	*	NS	*	*	NS	**
Protein and Lacto-Sacc interaction								
LP - LSO	5.30±0.40	3.84±0.42	3.70±0.42	296.7±20.7	1175±113	1528±160	11.6±1.0	74.0 ±4.6
LP - LS1	6.18±0.39	4.44±0.39	4.33±0.39	346.3±21.7	1217± 95	1618±128	12.5±0.6	83.8 ±4.3
NP - LS0	6.24±0.42	3.89±0.42	3.82±0.40	338.0±20.7	1188±127	1617±170	11.8±1.1	89.2 ±2.6
NP - LS1	5.97±0.42	4.97±0.46	4.89±0.45	348.3±23.2	1605±134	2171±183	13.4±1.1	103.0±2.6
Significance	NS	NS	NS	NS	NS	NS	NS	NS

NS = Not significant, * = P<0.05 ; ** = P<0.01

LS_{jk} = interaction between the j^{th} Lacto-Sacc level and sex,
PLS_{ijk} = interaction between the i^{th} dietary protein level, j^{th} Lacto-Sacc level and sex.

The data of slaughter test was analysed using the following model :

$Y_{ijkl} = \mu + P_i + L_j + S_k + PL_{ij} + PS_{ik} + LS_{jk} + PLS_{ijk} + b(X\text{-}x) + e_{ijkl}$ (3) where

μ, P_i, L_j, Pl_{ij}, PS_{ik}, LS_{jk}, PLS_{ijk} and e_{ijkl} as mentioned in model 2,
b = partial linear regression coefficient of Y_{ijkl} on slaughter weight,
X = value of slaughter weight
x = overall average of slaughter weight.

RESULTS AND DISCUSSION

Preweaning doe performance traits :

The study of the effects of protein level (18.4% as normal level and 16.3% as low level) and supplementation with Lacto-Sacc (0.1% vs 0.0%) in rabbit does showed that the diets containing normal protein level on one side and Lacto-Sacc supplementation on the other side improved the

Table 3 : Post weaning, litter weight and gain of New Zealand White growing rabbits as affected by protein level, Lacto-Sacc supplementation, sex and their interaction.

	Body weight (g)			Daily gain (g)		
	4 weeks	8 weeks	12 weeks	4-8 weeks	8-12 weeks	4-12 weeks
Protein level						
LP (14.6%)	425 ± 8	912 ± 15	1477 ± 23	17.4 ± 0.4	20.2 ± 0.5	18.8 ± 0.4
NP (16.3%)	433 ± 7	997 ± 12	1686 ± 15	24.6 ± 0.4	24.6 ± 0.3	22.4 ± 0.2
Significance	NS	**	**	**	**	**
Lacto-Sacc addition						
LSO	424 ± 9	942 ± 16	1547 ± 2.3	18.5 ± 0.4	21.6 ± 0.5	20.1 ± 0.3
LS1	434 ± 7	971 ± 12	1622 ± 17.1	19.2 ± 0.4	23.3 ± 0.4	21.2 ± 0.3
Significance	NS	NS	*	NS	*	*
Sex						
Males (M)	438 ± 8	988 ± 14	1643 ± 19	19.6 ± 0.4	23.4 ± 0.4	21.5 ± 0.3
Females (F)	420 ± 7	926 ± 14	1531 ± 21	18.1 ± 0.4	21.6 ± 0.4	19.8 ± 0.3
Significance	NS	**	**	**	**	**
Protein and Lacto-Sacc interaction						
LP - LS0	428 ± 13	912 ± 25	1485 ± 37	17.3 ± 0.6	20.5 ± 0.7	18.9 ± 0.6
LP - LS1	422 ± 10	913 ± 16	1469 ± 26	17.5 ± 0.5	19.6 ± 0.6	18.7 ± 0.4
NP - LS0	420 ± 11	975 ± 21	1617 ± 23	19.8 ± 0.5	22.9 ± 0.5	21.4 ± 0.3
NP - LS1	442 ± 9	1013 ± 15	1735 ± 18	20.4 ± 0.4	25.8 ± 0.4	23.1 ± 0.3
Significance	NS	NS	**	NS	**	**
Protein and sex interaction						
LP - M	440 ± 13	958 ± 22	1550 ± 31	18.5 ± 0.6	21.2 ± 0.6	19.8 ± 0.5
LP - F	410 ± 10	866 ± 19	1403 ± 32	16.3 ± 0.6	19.2 ± 0.7	17.7 ± 0.5
NP - M	436 ± 10	1014 ± 16	1725 ± 20	20.6 ± 0.4	25.4 ± 0.5	23.0 ± 0.3
NP - F	430 ± 11	980 ± 19	1646 ± 21	19.7 ± 0.5	23.8 ± 0.5	21.7 ± 0.3
Significance	NS	NS	NS	NS	NS	NS
Sex and Lacto-Sacc interaction						
M - LS0	435 ± 13	958 ± 23	1560 ± 32	18.7 ± 0.6	21.5 ± 0.6	20.1 ± 0.5
M - LS1	441 ± 10	1015 ± 15	1718 ± 19	20.5 ± 0.4	25.1 ± 0.5	22.8 ± 0.3
F - LS0	413 ± 12	925 ± 23	1534 ± 33	18.3 ± 0.6	21.8 ± 0.7	20.0 ± 0.5
F - LS1	426 ± 9	927 ± 17	1528 ± 26	17.9 ± 0.5	21.5 ± 0.6	19.7 ± 0.4
Significance	NS	NS	**	**	**	**
Protein, sex and Lacto-Sacc interaction						
LP - M - LS0	450 ± 19	942 ± 37	1510 ± 53	17.6 ± 0.9	20.3 ± 1.0	18.9 ± 0.8
LP - M - LS1	430 ± 17	976 ± 23	1594 ± 30	19.5 ± 0.6	22.1 ± 0.6	20.8 ± 0.4
LP - F - LS0	405 ± 16	882 ± 32	1459 ± 53	17.0 ± 0.8	20.6 ± 1.1	18.8 ± 0.8
LP - F - LS1	414 ± 12	850 ± 18	1344 ± 34	15.6 ± 0.7	17.7 ± 0.9	16.6 ± 0.6
NP - M - LS0	419 ± 16	975 ± 28	1611 ± 33	19.9 ± 0.7	22.7 ± 0.7	21.3 ± 0.5
NP - M - LS1	449 ± 13	1044 ± 19	1811 ± 18	21.3 ± 0.5	27.4 ± 0.5	24.3 ± 0.3
NP - F - LSO	421 ± 17	975 ± 32	1622 ± 32	19.8 ± 0.8	23.1 ± 0.6	21.5 ± 0.5
NP - F - LS1	435 ± 13	983 ± 23	1661 ± 27	19.6 ± 0.7	24.2 ± 0.7	21.9 ± 0.4
Significance	NS	NS	**	NS	NS	NS

NS = not significant ; * = P<0.05 ; ** = P<0.01 ; LP = Low protein level (14.6%), NP = Normal protein level (16.3%), LS0 = without Lacto-Sacc addition, LS1 = with Lacto-Sacc addition (0.1%).

Table 4 : Feed consumption and conversion, and profit analysis for New Zealand White growing rabbits fed different levels of protein and Lacto-Sacc.

Groups	Feed intake (g/day)	Feed convers. (g feed /g gain)	Feed cost (£E/ rabbit)	Return from body gain (£E/ rabbit)	Margin* (£E/ rabbit)
Protein level					
LP (14.6%)	97.5	5.19	2.29	6.32	4.03
NP(16.3%)	88.0	3.93	2.51	7.53	5.02
Lacto-Sacc addition					
LS0	93.5	4.65	2.44	6.75	4.32
LS1	92.0	4.34	2.40	7.12	4.72
Protein and Lacto-Sacc interaction					
LP - LS0	98.0	5.19	2.31	6.35	4.05
LP - LS1	97.0	5.19	2.28	6.28	4.00
NP - LS0	89.0	4.16	2.54	7.19	4.65
NP - LS1	87.0	3.77	2.49	7.76	5.28

Prices : LP diet = 0.42 £E per kg ; HP diet = 0.51£E per kg ; Rabbit live body weight = 6.0 E£ per kg ;
* Margin per head = Return form body gain – feed cost. Other head costs were assumed constant.
LP = Low protein level (14.6%), NP = Normal protein level (16.3%), LS0 = without Lacto-Sacc addition, LS1 = with Lacto-Sacc addition (0.1%).

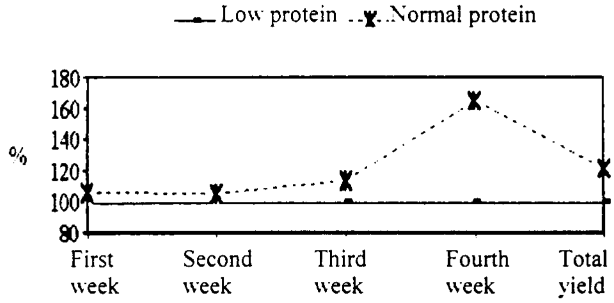

Figure 1 : The effect of dietary protein level on doe milk yield, when considering low protein level as 100%.

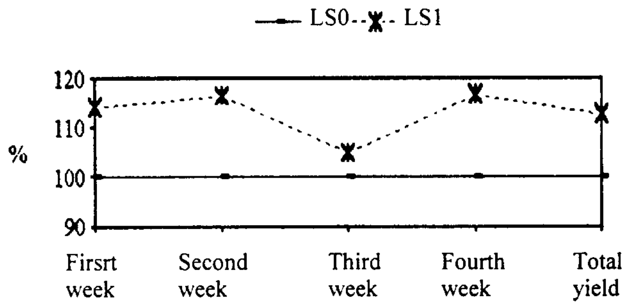

Figure 2 : The effect of Lacto-Sacc supplementation in rabbit diets on doe milk yield when considering group without Lacto-Sacc as 100%

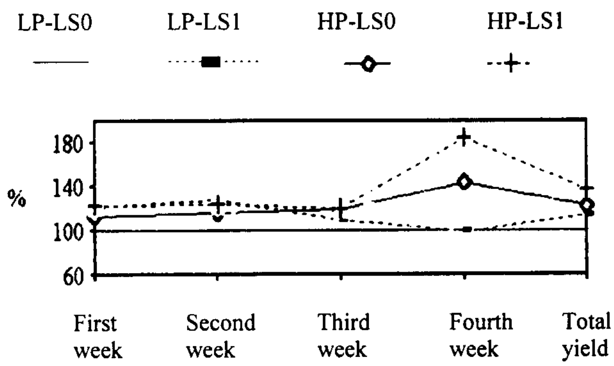

Figure 3 : The effect of interaction between protein level and Lacto-Sacc supplementation on doe milk yield when considering rabbit group which fed low protein without Lacto-Sacc addition as 100%.

preweaning doe performance traits, i.e. litter size and weight at birth and 21 and 28day, litter gain/day/litter (Table 2 and Figures 1, 2 and 3. The effects of the protein level were significant on litter weight at 28-day)P<0.05) and total milk yield (P<0.01). The Lacto-Sacc addition showed significant effects on litter size and weight at 21 and 28-day (P<0.05) and total milk yield (P<0.01). The increase values in litters size and weight at weaning in rabbit does fed normal protein were 8.5 and 20.1% than those fed low protein diet. Similar results were obtained by OMOLE (1982) and PARTRIDGE and ALLAN (1983). The increase values in litter size and weight at weaning and total milk yield due to Lacto-Sacc addition were 22.7, 20.0 and 14.5% respectively, than those fed diet without Lacto-Sacc. Similar results were reported by CHEEKE *et al.* (1989), HOLLISTER (1990), HOLLISTER *et al.* (1989-1990) EL-GAAFARY *et al.* (1992) and RASHWAN (1993). PARTRIDGE and ALLAN (1983) have shown that 21% protein diet is required for maximum lactation performance. On the other hand, SANCHEZ et al. (1985) recommended a level of 19% dietary protein for maximum production of lactating does. The high litter weights produced by does fed a diet supplemented with Lacto-Sacc may be a reflection of the high amounts of milk available for the young. The protein Lacto-Sacc interaction effects o all the pre-weaning doe traits were significant.

Post weaning litter growth performance

In the growing New Zealand White rabbits, the body weight and daily gain were improved with either diet containing normal protein level (16.3%) or that supplemented with Lacto-Sacc (Table 3). The effects of protein level were highly significant (P<0.01) on body weight at 8 and 12 weeks and on daily gain at 4-8, 8-12 and 4-12 weeks of age. Lacto-Sacc addition showed significant (P<0.05) effects on body weight at 12 weeks and on daily gain at 8-12 and 4-12 weeks of age. Similar results Lacto-Sacc addition showed significant (P<0.05) effects on body weight at 12 weeks and on daily gain at 8-12 and 4-12 weeks of age. Similar results were reported by ROSELL (1990) and AYYAT (1991 and 1994) in rabbits and HARKER (1990) in pigs. In the present study, Lacto-Sacc addition increased body gain with 5.5% than those fed diet without Lacto-Sacc, while TAWFEEK and EL-HINDAWY (1991) found that the increase in body gain with Lacto-Sacc addition was 13.0% in the same species. The male rabbits were significantly (P<0.01) higher than females in most of the post-weaning body weight and gain values (Table 3).

Table 5. Live weight means and least squares means (g) for carcass and some non-carcass components (adjusted for pre-slaughter live body weight) of New Zealand White rabbits as affected by dietary protein, Lacto-Sacc supplementation and sex.

Groups	Live body	Carcass	Liver	Kidney fat	Dressing %
Protein level					
LP (14.6%)	1627 ± 56	978 ± 8	62.4 ± 2.2	17.6 ± 0.7	57.5
NP (16.3%)	1797 ± 57	994 ± 5	59.9 ± 2.2	18.2 ± 0.7	57.9
Lacto-Sacc addition:					
LS0	1754 ± 71	985 ± 7	63.4 ± 2.1	17.7 ± 0.6	57.6
LS1	1670 ± 44	986 ± 7	58.8 ± 2.1	18.1 ± 0.6	57.8
Sex					
Male (M)	1786 ± 58	981 ± 8	62.0 ± 2.2	17.1 ± 0.7	57.3
Female (F)	1638 ± 56	991 ± 8	60.2 ± 2.2	18.7 ± 07	58.1
Protein and Lacto-Sacc interaction:					
LP - LS0	1684 ± 90	978 ± 10	62.5 ± 3.0	16.9 ± 0.9	57.4
LP - LS1	1570 ± 45	978 ± 11	62.3 ± 3.1	18.2 ± 0.9	57.8
NP - LS0	1825 ± 96	991 ± 11	64.3 ± 3.1	18.5 ± 0.9	57.7
NP - LS1	1770 ± 64	997 ± 10	55.4 ± 3.0	18.0 ± 0.9	58.1
Protein and sex interaction:					
LP - M	1670 ± 80	973 ± 10	62.1 ± 3.0	16.4 ± 0.9	57.1
LP - F	1584 ± 81	983 ± 10	62.7 ± 3.1	18.8 ± 0.9	57.8
NP - M	1902 ± 71	989 ± 11	62.0 ± 3.2	17.8 ± 1.0	57.4
NP - F	1693 ± 78	999 ± 10	57.7 ± 3.0	18.7 ± 0.9	58.4
Lacto-Sacc and sex interaction:					
M - LS0	1815 ± 96	983 ± 11	65.7 ± 3.0	17.2 ± 0.9	57.3
F - LS0	1694 ± 94	986 ± 10	61.2 ± 3.0	18.2 ± 0.9	57.8
M - LS1	1757 ± 53	979 ± 10	58.3 ± 3.0	16.9 ± 0.9	57.2
F - LS1	1583 ± 61	995 ± 10	59.3 ± 3.1	19.3 ± 0.9	58.4
Protein. sex and Lacto- Sacc interaction:					
LP - M - LS0	1697 ± 157	964 ± 15	63.6 ± 4.2	15.6 ± 1.3	56.3
LP - F - LS0	1671 ± 152	992 ± 15	61.5 ± 4.2	18.3 ± 1.3	58.1
LP - M - LS1	1643 ± 60	982 ± 15	60.6 ± 4.2	17.2 ± 1.3	57.5
LP - F - LS1	1496 ± 52.	975 ± 15	64.0 ± 4.2	19.3 ± 1.3	57.4
NP - M - LS0	1933 ± 138	1003 ± 15	67.8 ± 4.4	18.9 ± 1.4	58.1
NP - F - LS0	1716 ± 130	981 ± 14	60.9 ± 4.2	18.2 ± 1.3	57.3
NP - M - LS1	1870 ± 53	977 ± 15	56.2 ± 4.3	16.6 ± 1.3	56.8
NP - F - LS1	1669.± 102	1017 ± 15	54.6 ± 4.2	19.3 ± 1.3	59.6

Analysis of covariance did not show any significant effect for the factors studied.
LP = Low protein level (14.6%). NP = Normal protein level (16.3%).
LS0=Without Lacto-Sacc addition and LS1 = With Lacto-Sacc addition (0.1%)

The protein Lacto-Sacc interaction effects were highly significant ($P<0.01$) on body weight at 12 weeks and daily gain at 8-12 and 4-12 weeks of age. The protein sex interaction effects on the post-weaning weight and gain were not significant, while the sex-Lacto-Sacc interaction were highly significant on body weight at 12 weeks and daily gain at 4-8, 8-12 and 4-12 weeks of age. The protein, sex and Lacto-Sacc interaction effects were significant only on body weight at 12 weeks of age. Male rabbits fed sufficient protein level and supplemented with Lacto-Sacc showed higher body weight and gain than in the other

Feed intake and feed conversion were lower and values of feed cost, return and margin were higher in the growing rabbits fed normal protein level (16.3%), when compared to those fed low protein level (14.6%; Table 4), similar to that obtained by Ayyat (1994). Lacto-Sacc addition showed nearly similar trends, except the feed cost which was slightly/ lower with supplementation. Hollister *et* al. (1989) and Rosell (1990) found that addition of probiotic in rabbit diets improved feed conversion. The high return and margin values were obtained from the diets normal protein level and supplemented with Lacto-Sacc (Table 4).

Analysis of covariance of carcass and non-carcass components relatively to live body weight at slaughter did not show any significant effect for the factors studied. Dressing percentage increased slightly/ in rabbits fed normal protein diet supplemented with Lacto-Sacc (Table 5),

CONCLUSIONS

Addition of the probiotic Lacto-Sacc to the normal protein diet (18.4%) of New Zealand White dot rabbits, increased litter size and weight, preweaning litter survival rate doe milk yield. In offsprings, post-weaning grol4'th showed positive response with normal protein (16.3%) diet supplemented with 0.I% Lacto-Sacc. Efficiency of feed conversion was improved and cost per kilogram of meat produced was reduced with Lacto-Sacc supplementation. Males post-weaning performance was improved with normal dietary protein supplemented with Lacto-Sacc.

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REFERENCES

AYYAT M.S., 1991. Growth, feed efficiency and carcass traits of growing rabbits as affected by levels of dietary protein and sulphur amino acids. *Egyptian Journal of Rabbit Science;1, 1-12.*

AYYAT M.S., 1994. Effect of different levels of dietary protein and copper on growth performance in rabbits. *Egyptian Journal of rabbit Science, 4, 83 .92.*

CHEEKE P.R., HOLLISTER A.G., ROBINSON K.L., 1989, Improving feed efficiency and reducing mortality in rabbits: a case study for use in all species. Biotechnology in the feed industry. *Proc. of Alltech's Fifth Annual Symposium [edited by Lyons, T.P.], 253.259. Nicholasville, USA; Alltech Technical Publications.*

EL-GAAFARY M.N.,, RASHWAN A.A, EL-KERDAWY D.M.A, YAMANI K.A., 1992. Effect of feeding pelleted diet supplemented with probiotic Lacto-Sacc on digestibility, growth performance, blood constituents, semen characteristics and reproductive traits of rabbits. *Egyptian Journal of Rabbit Science*, **1**, 95-106,

HARKER A., 1990. Effect of Lacto-Sacc on pig performance. Biotechnology in the feed industry. *Proc. of Alltech's Sixth Annual Symposium [edited by Lyons, T.P.], 511. Nicholasville, USA; Alltech Technical Publications.*

HOLLISTER A.G., 1990. Manipulation of intestinal microbial activity in young animals to control mortality, Biotechnology in the feed industry. *Proc. of Alltech's Sixth Annual Symposium [edited by Lyons, T.P.], 153.165. Nicholasville, USA; Alltech Technical Publications.*

HOLLISTER A.G., CHEEKE P.R., ROBINSON K.L., PATTON N.M, 1989. Effects of water-administrated. probiotics and acidifiers on growth, feed conversion and enteritis mortality of weanling rabbits. *J. Appl. Rabbit Res., 12, .143-147.*

HOLLISTER A.G., CHEEKE P.R., ROBINSON K.L., PATTON N.M., 1990. Effects of dietary probiotics and acidifiers on performance of weanling rabbits. *J. Appl. Rabbit Res., 13, 6-9.*

NRC (1977). National Research Council. *Nutrient Requirements of Rabbits. 2nd Edition. Washington D.C.*

OMOLE T.A., 1982. The effect of level of dietary protein on growth and reproductive performance in rabbits. *J. Appl. Rabbit Res., 5, 83 .88.*

PARTRIDGE G.G., ALLAN S.J., 1983. The effects of dietary protein concentration on the lactation performance of the rabbit. *Animal Production, 37, 119-123.*

RASHWAN A.A., 1993. Reproduction performance of New Zealand White rabbits as affected by dietary supplementation with Lacto-Sacc, Bospro and a mixture of them, under Egyptian environmental conditions. *Egyptian J. Rabbit Sci., 3, 163.170.*

ROSELL V., 1990. Effect of Lacto-Sacc on the performance of growing rabbits. Biotechnology in the feed industry. *Proc. of Alltech's Sixth Annual Symposium [edited by Lyons; T.P.], 510, Nicholasville, USA; Alltech Technical Publications.*

SANCHEZ W.K., CHEEKE P.R., PATTON N.M, 1985. Effect of dietary crude protein level on the reproductive performance and growth of New Zealand White rabbits. *J. Anim. Sci., 60, 1029-1039.*

SNEDECOR G.W., COCHRAN, W.G., 1982 Statistical Methods. *6th Edition. Iowa State University Press, Ames, USA.*

TAWFEEK M.I, EL-HINDAWY M.M., 1991. Reproduction and growth performance of NZW and Cal. rabbits as affected by supplementation with Lacto-Sacc during summer. *Egyptian J. Rabbit Sci., 1, 124-135.*