

HIGH DIETARY FAT LEVEL IN RABBIT RATION CAN INFLUENCE LITTER SIZE, LITTER WEIGHT, MORTALITY RATE AND NUMBER OF SERVICES PER CONCEPTION?

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ABSTRACT

The present study was carried out at Rabbit Research Unit, Agricultural Researches and Experiments Station, Faculty of Agriculture Mansoura University, EL-Mansoura, Egypt, during the period from December 2013 to December 2014. This study aimed to examine the effect of increasing level of fat in the diet of does and bucks of *New Zealand* and *California* rabbits on their reproductive performance. The rabbit does and bucks within each strain (New Zealand White and California) were divided into two groups. The two groups were assigned at random to receive one of the two experimental diets which were formulated to be similar in DE but vary in EE. First group was fed on a commercial diet containing 3% fat (Control). Second group was fed on a diet supplemented with sunflower oil (rich in omega 6) to increase EE content to 6%. The following mating system was as follows:

- Treatment 1: bucks 3% inseminated does 3%.
- Treatment 2: bucks 3% inseminated does 6%.
- Treatment 3: bucks 6% inseminated does 3%.
- Treatment 4: bucks 6% inseminated does 6%.

Reproductive performance of does (number of service per conception, litter size and litter size weight at (birth, 21 days and weaning and mortality rate at (21 days and weaning) were recorded. In general, results show that increasing fat in the rations of bucks or does or both led to significant decrease in litter size at birth, 21 days and weaning compared to bucks and does fed control ration containing normal fat level. This was also accompanied by a significant decreased in weight of litter size. The results show higher number of services per conception in all treatment than the control ration. It is worth noting that average percentages of mortality rate at 21 days and weaning were significantly ($P < 0.05$) higher in rabbit buck or does or both treated with high level of fat than those fed on the control ration in New Zealand and California rabbit pups.

In conclusion, the addition of high level of fat (rich in omega 6 - sunflower oil) has reduced litter size, increased number of services per conception and increased mortality rate. This finding needs further studies to determine the effect of high level of fat on the parameters studied. This may be accomplished by measurement of fatty acid differentiation in blood plasma, follicular fluid and seminal plasma. In addition, measurement of pH value of vagina and seminal plasma could explain the effect of high level of fat on number of services per conception. While, analysis of does milk and anatomy of died pups could explain the higher mortality rate.

Keywords: Rabbits, dietary fat, reproductive performance.

INTRODUCTION

Rabbits are very prolific animals with relatively short parities particularly when raised under suitable environment and good management

system. They produce high numbers of viable kits born and weaned. Unlike large animals, they do not require physical strength. They are good converters of feed into body weight gain. Rabbit meat is white and is preferred because of its high nutritional value, since it has high protein and low fat and cholesterol contents compared to other animal meats. It is also light and has refreshing flavor.

Gaafar *et al.* (2014) concluded that doe rabbits fed diets supplemented with a combination of pumpkin and black seeds oils (2.5 g PS oil plus 2.5 g BS oil/kg diet) showed the best results concerning growth performance, milk yield and composition, blood parameters, immune response and reproductive performance as well as the best results regarding litter size and weight, mortality rate and growth performance of their offspring and economic efficiency. Skrivanova *et al.* (2009) concluded that under practical field conditions early weaning represents a risk for animal health and leads to a high mortality of young rabbits. Kowalska *et al.* (2008) fed female rabbits a complete diet with 3% fish oil supplement, quantitatively and qualitatively better milk fat content, higher fertility and prolificacy values, higher body weight of young rabbits at birth and at 21 and 35 days of age, and lower mortality were obtained. Milisits and Leval (2004) concluded that does selected for high body fat content have mostly higher conception rate, produce smaller litters at birth, but because of the lower mortality rate of their offspring during the suckling period they have larger and heavier litters at 21 day after parturition as compared to the non-fatty ones. Solerm *et al.* (2004) recommended that in order to reduce the mortality rate, it seems advisable the inclusion of digestible fibre instead starch and not a noteworthy increase of the animal fat content in diets for rabbits around weaning, but it is necessary to develop adequate feeding programs to maintain the reduction on mortality during the rest of growing period.

Sunflower oil is a monounsaturated (MUFA)/polyunsaturated (PUFA) mixture of mostly oleic acid (omega-9) linoleic acid (omega-6). Omega-6 have several positive rolls on human and animal health, particularly the ratio of omega-6 to omega-3 probably which has an important effect on several aspects of animal production and reproduction (Abayasekara and Wathes, 1999).

Therefore, the aim of this study was to determine the effect of adding high level of fat (sun flower oil) to the diet of does and bucks of New Zealand and California rabbits on their reproductive performance (number of services per conception, litter size and litter weight at (birth, 21 days and weaning mortality rate at (21 days and weaning).

MATERIALS AND METHODS

The present study was carried out at Rabbit Research Unit, Agricultural Researches and Experiments Station; Faculty of Agriculture Mansoura University, EL-Mansoura, Egypt, during the period from December 2013 to December 2014.

Animals:

A total number of 43 New Zealand White (NZW) and 37 California (CAL) does with approximately 5.3-5.5 months of age and 2.775 – 2.800 kg Live body weight (LBW) were used. In addition, 16 fertile rabbit bucks (8 NZW and 8 CAL) with approximately 7.5-8.1 mo. of age and 2.375-3.100 kg LBW were used for natural mating the does (1 buck/4-5 does).

Experimental design:

The rabbit does and bucks within each strain (New Zealand White and California) were divided into two groups. The two groups were assigned at random to receive one of the two experimental diets which were formulated to be similar in DE but vary in EE.

- **First Group:** was fed on a commercial diet containing 3% fat (Control).
- **Second group:** was fed on a diet supplemented with sun flower oil to increase EE content to 6%.

The formulation and chemical analysis of the two experimental diet are shown in tables 1 and 2, respectively.

Composite samples of diets were chemically analyzed before starting the experiment and then frequently throughout the experiment. The analysis included: Dry matter (DM), ash, crude protein (CP), ether extract (EE), crude fiber (CF) according to the official methods (AOAC, 2006).

Table (1): Formulation of the experimental diets (%) .

Ingredients	Diet 1(%)	Diet 2 (%)
Yellow corn	14	4
Barley	8	6
Wheat bran	26.2	32
Soybean meal 44%	7	6
Alfalfa hay	40	44
Molasses	2	2
Di calcium P.	1.2	1.2
Lime stone	1	1
Salt	0.3	0.3
Premix	0.3	0.3
Sunflower oil	0	3.25
Total	100	100
*Price (LE)/Ton	2753.8	2853.2

*based on the market price during the experiment being 2.1 LE/kg Yellow corn, 4.95 LE/kg Soybean meal, 1.9 LE/kg Wheat bran, 2.0 LE/kg Alfalfa hay, 3.5 LE/kg Barley, 6.5 LE/kg Di calcium P and 13.5 LE/kg Sunflower oil.

Table (2): Chemical analysis of the experimental diets (% as fed).

Item	3% EE diet	6% EE diet
Ash	13.5	16
Crude protein (CP)	15	16.5
Crude fat (EE)	3.5	6
Crude fiber (CF)	12.5	14.5
Nitrogen free extract	50.5	41
DE(Kcal/Kg)	2980	2795

Feeding and management

All bucks and does were subjected to adaptation period for 15 days before beginning the treatment period.

Rabbits in all groups were fed to cover their requirements according to NRC (1994).

All does and bucks were kept under the same conditions of management, being individually housed in metal cages (40 x 50 x 60 cm) provided with feeders and water nipple for drinking in each cage. The diets were offered to bucks and does in the morning (200-250 g/head). The temperature within the rabbitary was kept between 20-25°C throughout the experimental period using either fans and/or heaters.

Mating:

The following mating system was followed:

- Treatment 1: bucks 3% inseminated does 3%.
- Treatment 2: bucks 3% inseminated does 6%.
- Treatment 3: bucks 6% inseminated does 3%.
- Treatment 4: bucks 6% inseminated does 6%.

Rabbit does were mated throughout 10 days post partum . Pregnancy was handily diagnosed by palpation after 10 to 12 days post mating.

Rabbit does in each groups were kept until natural delivery for tow parities. Within 12 hours after kindling, litter size were checked, recorded and stillbirths were removed.

Afterwards, litters were examined each morning during the suckling period to remove the dead ones. In addition, mortality rate at 21 days and weaning of pups were recorded.

Data recorded for rabbit does were number of service per conception (NS), litter size at (birth, 21days and weaning (LSB, LS21 and LSW), litter size weight at birth, 21days and weaning (LWB, LW21 and LWW) and mortality rate at 21 days and weaning.

Statistical analysis:

The data of reproductive performance and offspring sex ratio were subjected to $2 \times 2 \times 2 \times 2$ factorial analysis of variance according to the following model:

$$Y_{ijklm} = \mu + P_i + S_j + T_k + X_m + PS_{ij} + PT_{ik} + PX_{im} + ST_{jk} + SX_{jm} + TX_{km} + PSTX_{ijklm} + e_{ijklm}$$

Where Y_{ijklm} = observed traits, μ =overall mean, P_i = fat level 1- 2 (1 = 3%, 2 = 6%), S_j = sex (doe and buck), T_k = strain (New Zealand and California), X_m = parity (1 and 2), PS_{ij} =interaction fat level x sex, PT_{ik} = interaction fat level x strain, PX_{im} = interaction fat level x parity , ST_{jk} = interaction sex x strain , SX_{jm} = interaction sex x parity , TX_{km} = interaction strain x parity , $PSTX_{ijklm}$ = interaction fat level x sex x strain x parity and e_{ijklm} =Random error.

The results of statically analysis revealed that the strain and parity and their interactions had no significant effects on studied traits. Accordingly,

studied traits were subjected to statistical analysis using two-way analysis of variance (2X2 factorial) according to (SAS 2004) using the following mathematical model:

$$Y_{ijk} = \mu + P_i + S_j + PS_{ij} + e_{ijk}$$

Where Y_{ijk} = observed traits, μ = overall mean, P_i = fat level 1- 2 (1 = 3%, 2 = 6%), S_j = sex (doe and buck), PS_{ij} = interaction fat level x sex, e_{ijk} = Random error.

Means were compared according to Duncan's Multiple Range Test at 0.05 level (Duncan, 1955).

RESULTS

1- The main effects of dietary fat level of New Zealand and California bucks on:

Litter size and litter weight of rabbit does:

Effects of adding fat (sunflower oil) to the ration of bucks on litter size and litter weight of rabbit does at birth, 21 days and weaning are presented in Table (3).

Analysis of variance revealed no significant ($P < 0.05$) effects of dietary fat level on litter size and litter weight of rabbit does at birth, 21 days and weaning.

In general, litter size and litter weight at birth, 21 days and weaning were lower, but not significant, in the group fed high level of fat than the control group either in New Zealand or California strain (Table 3).

Table (3): Main effect of dietary fat level of rabbit bucks on litter size and litter weight of rabbit does (New Zealand and California).

Parameter	New Zealand			California		
	3%	6%	SE	3%	6%	SE
LSB (#)	5.75	6.22	±0.31	5.91	5.52	±0.42
LWB (g)	307.45	336.35	±14.03	301.62	256.71	±19.79
LS21(#)	3.80	3.85	±0.30	4.26	3.91	±0.31
LW21 (g)	1153.44	1029.99	±71.36	1167.89	1040.77	±71.24
LSW (#)	3.46	3.21	±0.28	3.90	3.51	±0.27
LWW (g)	2283.33	1820.09	±161.93	2333.14	2048.87	±187.66

LSB=litter size at birth. LWB=litter weight at birth. LS21=litter size at 1days. LW21=litter weight at 21days. LSW=litter size at weaning. LWW=litter weight at weaning.

Number of service per conception of rabbit does and mortality rate of pups at 21 days and weaning:

Effect of adding fat to the ration of New Zealand and California buck rabbits on number of services per conception of rabbit does and mortality rate of pups at 21 days and weaning is shown in Table (4).

Analysis of variance revealed significant ($P < 0.05$) effect of fat level on number of service per conception (NS) of rabbit does in New Zealand strain, but not significant in California strain. Results show that number of services

per conception was significantly higher in New Zealand rabbit does treated with high level of fat compared to the control group (1.52 vs. 1.19, respectively).

Table (4):Main effects of dietary fat level of rabbit bucks on number of services per conception of rabbit does and mortality rate of pups at 21 days and weaning in New Zealand and California strains.

Parameter	New Zealand			California		
	3%	6%	SE	3%	6%	SE
NS	1.19 ^b	1.52 ^a	± 0.08	1.49	1.44	± 0.08
MR21 (%)	29.45	34.83	± 4.50	26.35	24.29	± 4.08
MRW (%)	38.65	44.90	± 4.01	32.94	29.99	± 4.26

^a and ^b: Means within the same row denoted with different superscripts are significantly different at (P<0.05).

NS=Number of services per conception.

MR21=Mortality rate at 21 days.

MRW= Mortality rate at weaning.

Average percentage of mortality rate at 21 days and weaning were insignificantly higher in rabbit does treated with high level of fat than the control group in New Zealand rabbit pups (34.83 and 44.90 vs. 29.45 and 38.65, respectively). On the contrary, mortality rate at 21 days and weaning were insignificantly lower in rabbit does treated with high level of fat than the control ration in California rabbit pups (24.29 and 29.99 vs. 26.35 and 32.94, respectively) .

2.The main effects of dietary fat level of New Zealand and California does on:

Litter size and litter weight:

Effects of adding fat (sunflower oil) to the ration of does on litter size and litter size weight of rabbit does at birth, 21 days and weaning are presented in Table (5).

Analysis of variance revealed significant (P<0.05) effect of supplementing the ration of rabbit does with high level of fat on litter size in California strain and litter size weight at birth and weaning in New Zealand and California strains.

Averages of litter weight at birth and weaned pups per New Zealand does were significantly higher in rabbit does fed the low fat control ration than those fed the high level of fat (347.42 and 2371.54 vs. 296.38 and 1731.87, respectively). While, the average of litter weight in California strain at birth was insignificantly higher (300.33 vs. 258.00, respectively).

Litter size at 21 days per California does was significantly higher in does fed the control ration than those treated with high level of fat (4.53 vs. 3.63)

Average of litter weight at 21days was insignificantly higher in New Zealand rabbit does fed the control ration than that of does fed the high level of fat (1167.51vs. 1015.92, respectively). The average of litter weight of California strain at 21 days and weaning per does was significantly higher in

rabbit does treated with control ration than treated with high level of fat (1251.69 and 2648.82 vs. 956.96 and 1733.19, respectively).

Table (5): Main effect of adding fat to ration of rabbit does on litter size and litter weight of New Zealand and California rabbit does.

Parameter	New Zealand			California		
	3%	6%	SE	3%	6%	SE
LSB (#)	6.31	5.67	±0.28	6.27	5.16	±0.38
LSWB (g)	347.42 ^a	296.38 ^b	±12.67	300.33	258.00	±18.20
LS21(#)	4.31	3.34	±0.27	4.53 ^a	3.63 ^b	±0.28
LW21 (g)	1167.51	1015.92	±64.47	1251.69 ^a	956.96 ^b	±65.53
LW (#)	3.77	2.90	±0.25	4.06	3.35	±0.25
LSWW (g)	2371.54 ^a	1731.87 ^b	±146.31	2648.82 ^a	1733.19 ^b	±172.62

^a and ^b: Means within the same row denoted with different superscripts are significantly different at (P<0.05).

LSB=litter size at birth. LSWB=litter weight at birth. LS21=litter size at 21days.
LW21=litter weight at 21days. LSW=litter size at weaning. LSWW=litter weight at weaning.

Number of service per conception of rabbit does and mortality rate of pups at 21 days and weaning:

Effect of adding fat to the ration of rabbit New Zealand and California does on number of services per conception and mortality rate of pups at 21 days and weaning is shown in Table (6).

Analysis of variance revealed insignificant (P<0.05) effect of dietary fat level on number of services per conception (NS) of New Zealand and California rabbit does.

Average percentages of mortality rate of New Zealand rabbit pups at 21 days and weaning were insignificantly higher in rabbit does fed high level of fat than the control ration, being 35.58 and 44.92 vs. 28.69 and 38.62, respectively.

Table (6): Main effect of adding fat to ration of rabbit New Zealand and California does on number of services per conception and mortality rate of pups at 21 days and weaning.

Parameter	New Zealand			California		
	3%	6%	SE	3%	6%	SE
NS	1.39	1.32	±0.07	1.37	1.56	±0.07
MR21 (%)	28.69	35.58	±4.06	24.92	25.72	±3.75
MRW (%)	38.62	44.92	±3.62	32.46	30.48	±3.92

^a and ^b: Means within the same row denoted with different superscripts are significantly different at(P<0.05).

NS=Number of service per conception. MRW= Mortality rate at weaning.
MR21=Mortality rate at 21 days.

3.Effect of adding fat to the rations of New Zealand and California rabbit bucks or does or both on:

Litter size and litter weight:

Effect of adding fat (sunflower oil) to the rations of New Zealand and California bucks or does or both on litter size and litter weight at birth, 21 days and weaning is shown in Table (7).

Table (7): Effect of adding fat to the rations of New Zealand and California rabbit bucks or does or both on litter size and litter weight at birth, 21 days and weaning.

Treatment	Mating system		New Zealand						California					
	Male	Female	LSB	LWB	LS21	LW21	LSW	LWW	LSB	LWB	LS21	LW21	LSW	LWW
			(#)	(g)	(#)	(g)	(#)	(g)	(#)	(g)	(#)	(g)	(#)	(g)
T1	3%	3%	6.34	340.03	4.84	1390.32	4.54	2980.35	7.05	354.41	5.41	1567.09	5.14	3447.05
T2	6%	3%	5.16	274.87	2.75	916.57	2.39	1586.31	4.78	248.83	3.10	768.68	2.66	1219.23
T3	3%	6%	6.27	354.80	3.77	944.70	3.00	1762.73	5.50	246.26	3.66	936.29	2.99	1850.60
T4	6%	6%	6.18	317.89	3.93	1115.28	3.42	1877.44	5.55	267.16	4.16	1145.24	4.04	2247.15
SE			0.37	16.69	0.35	84.88	0.33	192.62	0.52	24.55	0.38	88.36	0.34	232.76

LSB= litter size at birth.

LWB= litter weight at birth.

LS21= litter size at 21days.

LW21= litter weight at 21days.

LSW= litter size at weaning.

LWW= litter weight at weaning.

Analysis of variance revealed significant ($P<0.05$) effect of adding fat to the rations of New Zealand and California bucks or does or both on litter size and litter weight at 21 days and weaning of rabbit does.

In general, addition of fat to the rations of bucks or does or both led to significant decrease in litter size at birth, 21 days and weaning compared to bucks and does fed control ration containing normal fat level. This was also accompanied by a significant decreased in litter weight (Table7).

Number of services per conception of rabbit does and mortality rate of pups at 21 days and weaning:

Effect of adding fat (sunflower oil) to the rations of New Zealand and California bucks or does rabbit or both on number of services per conception and mortality rate of pups at 21 days and weaning is shown in Table (8).

Analysis of variance revealed insignificant ($P<0.05$) effect of dietary fat level on number of services per conception (NS) of New Zealand strain but had significant ($P<0.05$) effect in California strain.

It is worth noting that average percentage of mortality rate at 21 days and weaning were significantly ($P<0.05$) higher in rabbit buck or does or both treated with high level of fat than those fed on the control ration in New Zealand. Similar trend was observed for California rabbit pups except when both bucks and does were fed high level of fat. (table 8).

Table (8): Effect of adding fat to the rations of New Zealand and California rabbit bucks or does or both on number of service per conception and mortality rate of pups at 21 days and weaning.

Treatment	Mating system		New Zealand			California		
	Male	Female	NS	MR21 (%)	MRW (%)	NS	MR21 (%)	MRW (%)
T1	3%	3%	1.18	19.28	26.61	1.09	22.40	27.53
T2	6%	3%	1.21	39.61	50.69	1.88	30.31	38.36
T3	3%	6%	1.60	38.11	50.64	1.64	27.45	37.39
T4	6%	6%	1.44	31.55	39.15	1.24	21.13	22.60
SE			±0.09	±5.35	±4.77	±0.10	±5.06	±5.29

NS=Number of services per conception.

MR21=Mortality rate at 21 days.

MRW= Mortality rate at weaning.

DISCUSSION

In general, the results showed that addition of fat to the rations of bucks or does or both led to significant decrease in litter size at birth, 21 days and weaning compared to bucks and does fed control ration containing normal fat level. This was also accompanied by a significant decrease in weight of litter size. This results contrast with the data in literature, Hamed, (2013) found that used of 2 or 4% flaxseed oil lead to increase Litter size at birth in the 1st, 2nd and 3rd parity. Also use of 2% flaxseed oil lead to increase Litter size weight at birth in 7,14,21 and 28 day and increase litter size regardless the parity. Fortun-Lamothe (1995) showed that addition of fat in the diet has a positive effect on litter growth during lactation which must be related to the positive effect of dietary fat on milk production. Therefore, the weight of young rabbits at weaning is higher when their mothers received a fat-added diet: + 2.1% for each 1% increase in ether extract. Also, (Kowalska and Bielanski, 2004 and Muniz, *et.al.*, 2004) are reported that unsaturated fatty acids supplement caused decrease in the proportion of saturated fatty acids, which seems beneficial for young rabbits, just as the increase in the overall unsaturated acids.

Gaafar *et. al.* (2014) concluded that doe rabbits fed diets supplemented with a combination of pumpkin and black seeds oils (2.5 g PS oil plus 2.5 g BS oil/kg diet) showed the best results concerning growth performance, milk yield and composition, blood parameters, immune response and reproductive performance of does as well as the best results regarding litter size and weight, mortality rate and growth performance of their offspring and economic efficiency.

The present results cleared that the addition of a high level of fat (rich in omega 6) led to increased mortality rate of offspring. In contrast of the present data, Kowalska *et al.* (2008) found that in female rabbits fed a complete diet with 3% fish oil supplement, quantitatively and qualitatively better milk fat content, higher fertility and prolificacy values, higher body

weight of young rabbits at birth and at 21 and 35 days of age, and lower mortality were obtained.

Skrivanova and Marounek (2002) concluded that caprylic acid (saturated fatty acid) is capable to decrease mortality of young rabbits. Dierick *et al.* (2002) observed that the controlled release of medium-chain fatty acids (C6-C12) from coconut and *Cuphea* seeds oils rich in omega 6 resulted in significant suppression of the intestinal flora (total anaerobic count, lactobacilli, *E. coli*), improved mucosal health and growth performance of piglets.

In rabbits the high mortality of young rabbits among primiparous females was due to relatively low milk production, which increased with parity. The bacteriological tests of the rabbits with diarrhea symptoms showed that the main causes of mortality were the proliferation of conditionally pathogenic *Escherichia coli*, responsible for enteritis, and the presence of beta-hemolytic *Streptococci*, which are relatively or conditionally pathogenic bacteria (Skrivanova and Marounek, 2002).

The increase of pre-weaning mortality associated with the increase in litter size at birth and reduction of re-mating interval period, although doe milk yield appeared to be the most important factor in this respect. Thus, all factors which may decrease doe rabbit milk (nutrition, management of the rabbitry, climatic conditions and doe diseases), increase preweaning mortality (Rashwan and Marai, 2000).

In conclusion, the addition of high level of fat (rich in omega 6-sunflower oil) has reduced litter size, increased number of services per conception and increased mortality rate. This finding needs further studies to determine the effect of high level of fat on the parameters studied. This may be accomplished by measurement of fatty acid differentiation in blood plasma, follicular fluid and seminal plasma. In addition, measurement of pH value of vagina and seminal plasma could explain the effect of high level of fat on number of services per conception. While, analysis of does milk and anatomy of died pups could explain the higher mortality rate.

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هل يمكن أن تؤثر إضافة مستوى عالي من الدهون الغذائية إلى علائق الأرانب على حجم ووزن ومعدل نفوق الخلفه وعدد التلقيحات اللازمة للإخصاب؟

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أجرى هذا البحث في وحدة بحوث الأرانب التابعة لمحطة التجارب والبحوث الزراعية بكلية الزراعة - جامعة المنصورة - مصر، خلال الفترة من ديسمبر ٢٠١٣ إلى ديسمبر ٢٠١٤م. وكان الهدف من هذا البحث هو تحديد تأثير إضافة نسبة عالية من الدهن في علائق كل من ذكور أو إناث الأرانب (النيوزيلاندي و الكاليفورنيا) أو كلاهما على حجم ووزن ومعدل نفوق الخلفه وعدد التلقيحات اللازمة للإخصاب (الأداء التناسلي) لإناث الأرانب النيوزيلاندي والكاليفورنيا. تم تقسيم كل من ذكور وإناث الأرانب (النيوزيلاندي و الكاليفورنيا) عشوائياً إلى مجموعتين: **المجموعة الأولى:** غذيت على عليقة تجارية ٣% دهن (المجموعة القياسية). **المجموعة الثانية:** غذيت على عليقة أضيف إليها زيت عباد الشمس (الغني في محتواة من الأوميغا ٦) لزيادة المستخلص الإيثيري إلى ٦%.

وكانت العليقتين متساويتين تقريباً في محتواها من الطاقة ومختلفة في نسبة الدهن.

وكان نظام التلقيح كالتالي:

المعاملة الأولى: ذكور مغذاة على ٣% دهن لقت إناث مغذاة على ٣% دهن.

المعاملة الثانية: ذكور مغذاة على ٣% دهن لقت إناث مغذاة على ٦% دهن.

المعاملة الثالثة: ذكور مغذاة على ٦% دهن لقت إناث مغذاة على ٣% دهن.

المعاملة الرابعة: ذكور مغذاة على ٦% دهن لقت إناث مغذاة على ٦% دهن.

تم قياس الأداء التناسلي لإناث الأرانب من خلال عدد التلقيحات اللازمة للإخصاب، حجم الخلفة ووزنها عند (الميلاد، ٢١ يوم والفظام)، معدل النفوق عند (٢١ يوم والفظام).

بشكل عام كانت أهم النتائج المتحصل عليها هو أن زيادة نسبة الدهن في علائق كل من الذكور أو الإناث أو كلاهما أدى إلى إنخفاض معنوي في حجم المواليد (عند الميلاد، ٢١ يوماً والفظام) مقارنة بذكور وإناث الأرانب المغذاة على العليقة القياسية. وتبع الإنخفاض في حجم الخلفة إنخفاض أيضاً في وزن الخلفة. أيضاً زاد عدد التلقيحات اللازمة للإخصاب عند زيادة مستوى الدهن في علائق الإناث أو الذكور أو كلاهما بالمقارنة بالمجموعة القياسية. ومن الجدير بالذكر أن متوسط النسبة المئوية لمعدل النفوق عند ٢١ يوم وعند الفظام كان أعلى معنوياً في خلفات الذكور أو الإناث أو كلاهما المغذاه على نسبة عالية من الدهن مقارنة بخلفات المجموعة القياسية.

نستخلص من هذه النتائج أن إضافة نسبة عالية من الدهن (زيت عباد الشمس - الغني في الأوميغا ٦) إلى علائق ذكور أو إناث الأرانب أو كليهما أدى إلى تقليل حجم الخلفة وزيادة عدد التلقيحات اللازمة للإخصاب وكذلك ارتفاع نسبة النفوق في الخلفات. وهذه النتائج تحتاج إلى مزيد من الدراسات ليبحث تأثير التغذية على مستوى عالي من الدهن على الصفات المدروسة. ومن الممكن تفسير ذلك من خلال عمل تحليل للأحماض الدهنية في كل من بلازما الدم، السائل الحويصلي و بلازما السائل المنوي وذلك لملاحظة مدى التغير في نسب الأحماض الدهنية نتيجة لإختلاف مصدر الدهن وكذلك نسبته. بالإضافة إلى ذلك فإن قياس درجة الحموضة في المهبل وبلازما السائل المنوي يمكن أن تفسر تأثير إضافة النسب العالية من الدهن على عدد التلقيحات اللازمة للإخصاب. كذلك فإن تحليل لبن الأمهات وكذلك تشريح الخلفات النافقة يمكن أن يفيد في تفسير نسبة النفوق العالية.