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PHYSIOLOGICAL, REPRODUCTIVE AND PRODUCTIVE PERFORMANCE OF FATTENED HY-PLUS RABBIT DOES AS AFFECTED BY FEED RESTRICTCTION REGIMES

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The present work was aimed to study the reproductive capability of fattened Hy-Plus rabbit does as influenced by feed restriction regimes. Eighty seven fattened mature Hy-plus multiparous rabbit does (aged 14 months and weighed 4681 ± 72 g) were used.

The rabbit does were divided into three experimental homogeneous comparable groups (29 does each). The first group (control) was fed 150 g/ doe daily a commercial diet. While the 2nd and the 3rd groups (treated groups) were fed the same diets but does in the light restriction regime (LR) were fed 120 g diet/ doe/ day for up 14 days and those in strong restriction regime (SR) were fed 100 g diet/ doe/ day for up 3 days before their inseminated artificially, respectively. All does within all groups were fed 170 g diet/ doe daily, after insemination.

Results obtained showed that, body weights of fattened Hy-Plus rabbit does at insemination, at day10 of pregnancy and at weaning day were significantly (P≤0.05) affected by feed restriction regime means. Weights were arranged (P≤0.05) descendingly as recorded by rabbit does in control, SR then LR group, respectively. While weights at day 20 of pregnancy and on delivery day were insignificantly high and in descending order of does, control; SR then LR, respectively. Blood picture and total protein and its fractions and some enzymes indicated that liver and kidney functions of fattened mature Hy-plus rabbit does significantly (P≤0.05) affected by feed restriction regime. Such parameters were better (P≤0.05) descendingly being SR and LR regime, than control group, respectively. Sexual hormones concentration and leptin hormone levels in blood were significantly (P≤0.05) high, while leptin hormone concentrations in milk were non-significantly low in SR regime and LR regime, than control group,

respectively. Fertility trait was affected (P≤0.05) by feed restriction regime. Each of conception; kindling and abortion rates and litter size and weight at birth and at weaning were significantly (P≤0.05) high due to SR regime followed by LR regime, then control group. Bunny weight at birth and at weaning didn't affected significantly by feed restriction regime, while rabbit does exposed to LR regime recorded pre-weaning mortality rates significantly (P≤0.05) higher than those of SR regime, then control group. Milk yield and milk lactose of fattened Hy-Plus rabbit does were high (P≤0.05) due to SR regime, then LR regime and control group.While percentages of milk protein; fat and ash didn't affected significantly by feed restriction regime

Conclusively, *it could be concluded that, there was strong relationship between low fertility of rabbit does and their fattening. Deleteriously effects of fattening on rabbit does reproductivity could be alleviated by using feed restriction regime.*

Key words: Rabbit; doe; feed restriction; fertility; blood

Nutritional disorders are known to reduce reproductive and productive performance (Rommers *et al.*, 2004a and Brecchia *et al.*, 2006). Diets with adequate energy contents can induce both an excessive fatness and malnutrition of the does with subsequent reduction of the number and growth of newborns (Fortun-Lamothe and Lebas, 2006 and Matsuoka *et al.*, 2006). Overfeeding during rearing period has related with low reproductive performance in dairy heifers (Sejrsen *et al.*, 1982), pullets (Whitehead, 1988) and gilts (Klindt *et al.*, 1999). Young rabbit females fed ad libitum until first parturition usually suffer similar problems to those-mentioned for other species (Maertens, 1992). For this reason, in the last decade, some works assessed the possible impacts of different management and feeding plans for the rearing period on female development and reproduction: feed restriction (Rommers *et al.*, 2004b), body weight at weaning at the first artificial insemination (Rommers *et al.*, 2002) and the use of fibrous diets (Quevedo *et al*., 2005). However, some of these works have shown an antagonism between proper development and improvement of reproductive response. The earlier the introduction of the restriction programme and the low the energy supply, the high the voluntary feed intake of primiparous does with improved milk yield or reduced body reserves mobilization during first lactation (Nizza *et al.*, 1997), but later or the low their pubertal maturation (Rommers *et al.*, 2004c). Leptin may act as a critical link between adipose tissue and the reproductive system, indicating whether

adequate energy reserves are present for normal reproductive function (Moschos *et al*., 2002).

Therefore, the present study was designed to evaluate Physiological, reproductive and productive traits of fattened Hy-Plus rabbit does as affected by different feeding restricted. The first group (untreated).While the 2nd group were fed 120g diet/doe/ day for 14days, and the 3rd group were fed 100g diet/doe/day for 3days before insemenated artificially.

MATERIALS AND METHODS

Animals and management

The present trial was carried out in an industrial Rabbitry, located at Sakarah city, Giza province, Egypt. Whereas, the laboratory work was conducted in Animal Production Research Institute, in partnership with Animal Reproduction Research Institute, Agriculture Research Center, Giza, Egypt.

A total number of 87 fattened Hy-Plus multiparous rabbit does aged 14 months and 4681 ± 72 g average body weight were used in the present work. All the experimental rabbit does were healthy and clinically free from the internal and external parasites and were kept under the same managerial and hygienic conditions according to the Rabbitry routine work. The rabbit does were divided into three experimental homogeneous comparable groups (29 does /group). Rabbits within the first group were fed 150 g/ doe daily a commercial diet according to NRC (1977) recommendations and they were kept untreated as a control group. While rabbits in the 2nd and 3rd groups (treated groups) were fed the same basal diet and exposed to two different feed restriction regimes before their insemination artificially. Does in the 2nd group were fed 120 g basal diet/ day/doe for 14 days continuously as a light restriction regime (LR). Whereas, those in the 3rd group were fed only 100g basal diet/day/doe for 3days as a strong restriction regime (SR). After insemination, all does were fed the same basal diet at a rate of 170 g/ day/ doe.

The ingredients and chemical composition of the basal pelleted ration fed to rabbits, during the whole experimental period are shown in Table 1**.**

Fertility traits

Does were weighed individually at the beginning of the experiment; at insemination day, at the 10th and the 20th day of pregnancy, as well as, at delivery and weaning days.

Palpation of all rabbit does was carried out on day 12 post insemination to determine pregnancy. At kindling,values abortion; conception and kindling

Table 1. The ingredients and chemical composition of the pellet ration fed to rabbits, during the experimental period.

Ingredients	**(%)**	**Vitamins and Minerals premix per Kilogram.**	
Clover hay	40.50	Vit.A (IU)	10000
Wheat bran	25.00	Vit.D3 (IU)	9000
Yellow corn	14.00	Vit.E (IU)	10000
Soybean meal (44%)	11.00	Vit.K (IU)	3
Molasses	3.00	Vit.B1 (IU)	2
Vinass	3.00	Vit.B2 (IU)	6
Bone meal	1.75	Vit.B6 (IU)	2
Lime stone	0.70	Biotin (mg)	0.2
Sodium chloride	0.55	Choline (mg)	1200
Vitamins & mineral premix	0.35	Niacine (mg)	40
DL-methionine	0.15	Zn. (mg)	60
Total	**100**	Cu. (mg)	0.1
Calculated chemical composition **		Mn. (mg)	85
Crude protein (CP)%	18.00	Fe. (mg)	75
Ether extract (EE)%	3.00	Folic acid (mg)	5
Crude fiber (CF)%	14.00	Pantothenic acid (mg)	20
Digestible energy (Kcal/Kg)	2720.00		

** Calculated according to NRC (1977) for rabbits.

rates and litter size and weight at birth were recorded. Pre-weaning mortality rates and milk yield per doe were estimated weekly during the suckling period. The youngs of each litter were prevented from suckling for 24 hours by separation from the doe. The bunnies and doe were weighed before and after suckling and the mean of increase in weight of bunnies and decrease in weight of doe were indicated as daily milk yield (Davies *et al* ., 1964). Milk samples were taken individually within each group, on the 21st day of lactating period (peak of milk production). A part of fresh milk sample was immediately analyzed to determine milk protein, fat, lactose and ash by using Milkoscan® analyzer-130 B, N. Foss Electronic-Denmar.

Blood sampling and analyses

Blood samples of rabbit does were collected from the marginal ear vein of the four does within each experimental group at day 15 of pregnancy. The samples were collected into dry clean centrifuge tubs, the plasma were separated by centrifugation of blood at 3000 rpm for 15 min, and stored in deep freezer at-20°C until biochemical analysis. Non-coagulated, fresh blood was tested shortly after collection for determination of blood pictures including red blood cells count (RBCs,10^6/ mm^3), white blood cells count (WBCs, 10^3/ mm^3) and hemoglobin (Hb, g/dl) and hematocrite concentration according to Drew *et al*. (2004). Total protein (TP, g/ dl) and albumin (Alb, g/ dl) levels were determined using commercial kits supplied by Randox (Randox laboratories Ltd, Crumlin, Co, Antrim, UK) according to Doumas *et al*.(1981). Golbulin (Glb, g/ dl) concentration was estimated by subtracting the values of Alb from the corresponding values of TP per sample. Plasma creatinine (Crea. g/ dl) was determined by the colorimetric method with commercial kits obtained from Bochringer (Germany). plasma samples were analyzed for determinations of aspartate aminotransferase (AST, U/L), alanine transaminase (ALT, U/L), using a commercial kits (Linear Chemicals, Barcelona, Spain) according to the manufacturer procedure. All samples were run in duplicate and assayed by the same investigator, who was blind to the experimental situation.

Hormonal assays

The tested hormones Estradioll-$17_{2\alpha}$ (E 2) and progesterone (P4)levels were quantified by RIA technique as described by Dubourdieus *et al*. (1994) and Benkrane (1989) and Garret (1989), respectively. All kits were purched from Immuno-Tech Company and the analysis was done according to the outlines described by the manufactures. Blood sampling for leptin were determined by double antibodyRIA using the multi-species leptin kit (Linco Research Inc., St. Charles, MO, USA) as reported by (Brecchia *et al.,* 2008).

Blood urea nitrogen level was assayed by quantitative colorimetric method and measured by spectrophotometer at 525 nm (Sigma kits). Blood NH3 was determined according to Conway (1957) method.

Statistical analysis

Data were analyzed using the General Linear Model procedure of SAS Program **SAS (2001)**.

$$\mathbf{Y_{ij} = \mu + D_i + e_{ij}}$$

Where Y_{ij} is the observation on ij^{th} trait, μ is the overall mean, D_i is the effect of i^{th} diet and e_{ij} is the random error. Percentage values were transformed to *arc-sin* values before being statistically analyzed. Numbers of conceived

does and kindling rates were analyzed using the Contingency Tables according to Everitt (1977). Duncan's new multiple range tests was used to test the significance of the differences between means Duncan (1955).

RESULTS AND DISCUSSION

Body weights

Data presented in Table 2 showed that, body weights (BW) of fattened rabbit does at insemination day; on day 10 of pregnancy and weaning day were significantly ($P \leq 0.05$) affected by feed restriction and regime means. Weights were arranged ($P \leq 0.05$) in descending order as recorded by rabbit does in control, SR then LR, group, respectively. While, weights of rabbit does on day 20 of pregnancy and on delivery day were insignificantly high and in being descending order as recorded by does in control; SR then LR, respectively.

Fertility traits

Data in Table 3 indicated that, fertility traits of fattened Hy-plus rabbit does, inseminated artificially were significantly ($P \leq 0.05$) affected by feed restriction regime. Each of conception; kindling and abortion rates and litter size and weight at birth & at weaning were significantly ($P \leq 0.05$) higher due to SR regime followed by LR system, than control group. Bunny weight at birth and at weaning didn't affected significantly by feed restriction regime, while fattened Hy-Plus rabbit does exposed to LR system recorded pre-weaning mortality rates significantly ($P \leq 0.05$) higher than those of SR regime and then control group. This may be due to increase litter size in LR and SR regime than control and this is in normal range.

Milk yield and composition

Data in Tables 4 and 5 revealed that, milk yield and lactose of fattened Hy-Plus rabbit does the were highly significant ($P \leq 0.05$) during SR regime, followed by LR regime, and then control group, respectively, while percentages of milk protein; fat and ash didn't significantly affected by feed restriction regime.

Blood constitutes

Data presented in Table 6 stated that, blood picture represented in RBCs ,WBCs, Hg and Ht, serum total protein and its fractions (albumin; globulin and A/G ratio); some enzymes indicated liver function (AST and ALT) and kidney function (blood NH3 and blood urea) were of fattened mature Hy-plus rabbit does significantly ($P \leq 0.05$) affected by feed restriction regime.

Table 2. Weight of fattened mature Hy-plus rabbit does, during different physiological status as affected by feed restriction regime (Means±SE).

Doe weight	Control	Feed restricted groups	
		LR	SR
Initial weight	4697.3±104.2	4668.4±112.6	4681.9±127.2
at insemination day	4742.6±97.3 [a]	4496.7±124.6 [b]	4604.8±109.3[ab]
On day 10 [th] of pregnancy	4785.3±102.6 [a]	4560.0±113.7 [b]	4664.8±118.2[ab]
On day 20 [th] of pregnancy	4840.2±108.3	4653.8±99.2	4751.9±127.3
On delivery day	4987.3±106.6	4802.6±127.2	4892.7±116.7
At weaning day	4771.2±103.5 [a]	4507.6±113.3 [b]	4531.3±129.6[ab]

Means within the same row bearing different letter superscripts (a, b) are significantly (P≤0.05) different.

Table 3. Fertility traits of fattened mature Hy-plus rabbit does, inseminated artificially as affected by feed restriction regime (Means±SE).

Variable	Control	Feed restricted groups	
		LR	SR
Number of inseminated does	29	29	29
Number of conceived does	10[c]	16 [b]	20 [a]
Conception rate (%)	34.5 [c]	55.2 [b]	68.9[a]
Number of kindled does	10 [c]	15 [b]	19 [a]
Abortion rate (%)	0.00 [c]	6.22 [b]	5.00 [a]
Kindling rate (%)	34.5 [c]	51.75 [b]	65.52 [a]
Litter size at birth	4.93 ± 0.49[b]	6.87 ± 0.63[a]	6.93 ± 0.60[a]
Bunny weight at birth (gm)	47.53 ± 3.42	44.89 ± 3.09	44.95 ± 4.12
Litter weight at birth (gm)	234.9 ± 29.6[b]	308.7 ± 34.2[a]	311.8 ± 32.8[a]
Litter size at weaning	4.84 ± 0.42[b]	6.04 ± 0.48[a]	6.11 ± 0.49[a]
Pre-weaning mortality rate	1.83 ± 0.11[b]	12.08 ± 2.03[a]	11.83 ± 1.52[a]
Bunny weight at weaning (gm)	862.9 ± 37.4	814.3 ± 33.8	803.7 ± 34.8
Litter weight at weaning (gm)	4178.7±29.6[b]	4916.5±34.2[a]	4912.2±32.8[a]

Means within the same row bearing different letter superscripts (a, b) are significantly (P≤0.05) different.

Table 4. Milk yield (g/ doe) of fattened mature Hy-plus rabbit does, inseminated artificially as affected by feed restriction regime (Means±SE).

Nursing period		Control	Feed restricted groups	
From	Till		LR	SR
Birth	7 days	584.3±41.2[b]	692.7±57.3[a]	721.4±61.8[a]
Birth	14 days	1232.6±87.3[b]	1518.9±92.6[a]	1561.3±97.5[a]
Birth	21 days	2134.6±111.2[b]	2501.3±129.3[a]	2618.9±130.2[a]
Birth	28 days	2962.4±132.9[b]	3403.4±134.6[a]	3589.2±151.2[a]
Birth	35 days	3351.3±161.9[b]	3859.4±157.3[a]	3972.8±169.5[a]

Means within the same row bearing different letter superscripts (a, b) are significantly (P≤0.05) different.

Table 5. Milk composition of fattened mature Hy-plus rabbit does, as affected by feed restriction regime (Means±SE).

Milk composition(%)	Control	Feed restricted groups	
		LR	SR
Milk protein	11.79±0.48	11.51±0.57	11.86±0.43
Milk fat	17.92±0.31	18.12±0.52	17.89±0.46
Milk lactose	3.66±0.17[b]	3.91±0.33 [ab]	4.18±0.22 [a]
Milk ash	4.52±0.33	4.59±0.26	4.71±0.31

Means within the same row bearing different letter superscripts (a,b,c) are significantly (P≤0.05) different.

Table 6. Blood picture and some blood serum constitute of fattened mature Hy-plus rabbit does as affected by feed restriction regime (Means±SE).

Variable	Control	Feed restricted groups	
		LR	SR
Red blood cells (N x 10^6/ mm^3)	5.47 ± 0.29[b]	6.33 ± 0.37[a]	6.74 ± 0.35[a]
White blood cells (N x 10^3/ mm^3)	6.97 ± 0.33[b]	7.59 ± 0.40[ab]	7.78 ± 0.40[a]
Hemoglobin (gm/ dL)	10.38 ± 0.47[b]	11.89 ± 0.39[a]	12.09 ± 0.44[a]
Hematocrite (%)	32.87 ± 1.19[b]	35.07 ± 1.42[ab]	36.31 ± 1.59[a]
Total protein (m gm/ 100ml)	6.37 ± 0.17[c]	7.46 ± 0.14[b]	7.88 ± 0.22[a]
Albumin (m gm/ 100ml)	3.07 ± 0.07[c]	3.73 ± 0.08[b]	3.99 ± 0.08[a]
Globulin (m gm/ 100ml)	3.30 ± 0.04 [c]	3.73 ± 0.02 [b]	3.89 ± 0.03 [a]
A/ G ratio	0.930 ± 0.01[b]	1.00± 0.01 [ab]	1.026± 0.02 [a]
AST (U/ L)	22.46 ± 1.24[b]	27.83 ± 1.97[ab]	28.92 ± 1.44[a]
ALT (U/ L)	14.04 ± 0.78[b]	16.89 ± 0.74[ab]	16.96 ± 0.93[a]
Blood NH3 (µg/ ml)	5.17 ± 0.18[a]	4.52± 0.29[b]	4.23 ± 0.11[b]
Blood Urea N (mg/ dl)	14.45 ±1.14[a]	11.82 ±0.82 [b]	10.91±0.66 [b]

Means within the same row bearing different letter superscripts (a,b,c) are significantly (P≤0.05) different

Such parameters were significantly (P≤0.05) better descendingly due to SR regime, LR system, and then control group, respectively.

Hormonal profiles

Sexual hormones concentration in E2 and P4 and leptin hormone levels in blood were significantly (P≤0.05) high, while leptin hormone concentrations in milk were non-significantly low as recorded by fattened Hy-plus rabbit does in SR regime and LR system, then control group, respectively, (Table 7).

Heavy breeds in all species have low fetility in males and females and produce few offspring.The rabbit does which used in this experiment were suffering from over weight which was higher than the normal weight by (600-700g) for this breed and at that age. This over weight caused a negative effect on reproductive performance of these does as shown in Table 2 .

To solve the over weight problem and bad productive performance in this herd we used two feeding plane, where the rabbit does were subjected to feed restriction before AI, light and strong regime. The feed offered were reduced from 150 to 120 or 100 gm in (light and strong) regime, respectively.

The data in Table 3 showed that there was a problem in ovulation and pregnancy, where the does were suffer from low pregnancy rate ,it was 34 % in control group and the treated groups recorded (55.2 % and 68.9 %) in LR and SR, respectively and this improvement in pregnancy rate in treated groups were due to feed restriction regime before insemination. The purpose of this feeding plan was to prevent the excessive fat deposition that already found in does under study. The effect of feed restriction regime on the regulatory mechanisms of metabolism during reducation and compensatory growth has been investigated in several animal species (Rhind *et al*., 2000). Although, the basic underlying physiological responses to underfeeding might be common to all mammals. Improving fertility rate by fasting was reported by Eiben *et al.,* (2010) who noticed a better fertility rate generally in the treated group (P<0.10) and can be explained by the older breeding age and by the favorable influence of flushing on ovulation and kindling rate was the highest over the whole experimental period.

Also Table 4 and 5 showed that litter size at birth increased significantly (P≤0.05) in treated groups and recorded 40% more than control group.While,the bunny weight at birth in treated groups not affected significantly and the difference was less than 2.5 g, this difference continues to weaning. Although the does under feed restriction but the milk production increased significantly about 500-600 g compared to control

Table 7. Sexual hormones concentration and leptin hormone level of fattened mature Hy-plus rabbit does, as affected by feed restriction regime (Means±SE).

Hormones concentration	Control	Feed restricted groups	
		LR	SR
Estradiol $17_{2\alpha}$ (pg/ ml)	25.31±1.15[b]	28.57±1.43[a]	28.82±1.44[a]
Progesterone (pg/ ml)	0.717±0.012[b]	0.794±0.022[a]	0.798±0.023[a]
Leptin in blood serum (ng/ dl)	4.21±0.40[c]	5.01±0.36[b]	5.91±0.44[a]
Leptin in milk (ng/ dl)	3.42±0.31	3.29±0.24	3.24±0.29

Means within the same row bearing different letter superscripts (a,b,c) are significantly (P≤0.05) different.

group. This may be due to increased litter size at birth in groups of regime (LR-SR). The content of fat and protein didn't affected and were almost equal in all groups. Does will secrete more milk if litter size at birth is large (EL-Maghawry *et al*., 1993). This increase in milk production, is however, not entirely proportional to the needs of more suckling. There were a negative correlation between litter size and individual bunny weight Therefore, one kit consumes less milk and so the individual weight will be low (Petersen *et al*., 1996). When both litter size and individual weight of suckling rabbits increase this could be only due to the high milk production of the doe. This could be explained our result in increasing the total litter weight and decrease individual weight at birth and weaning and increase milk production in SR then LR than control. This is in agreement with Eiben *et al*. (2010)

It is known that, there is an inverse relationship between fatting and productive performance where there were an improvement in sexual hormones (estrogen and progesterone) in treated groups as a resulte of feed restriction compared to control group. Also, this improvement reflect on blood picture and other parameters which greatly improved compared to control groups. Leptin is produced by adipose tissue and its blood levels are correlated with body reserves and the availability of nutrients (Ahima and Flier, 2000). Moreover, it is involved in the regulation of body weight either suppressing appetite or increasing metabolic rate (Friedman and Halaas, 1998). Leptin produced and secreted by adipose cells is an important in the long-term regulation of body weight and body fat mass content.The gradual increase of the circulating leptin in rabbits may reflect improvement of sexual hormones and fertility (Barb *et al*., 2001a) as shown in Tables 6 and 7.

Ther present results on leptin concentrations of blood serum during feed restriction are in agreement with partially comparable with those of Chilliard *et al*. (2000) and Barb *et al*. (2001b). All sexual hormone here are more related to the feed restriction program and it was in agreement with other studies in heifers (Hornick *et al*., 1998); and in sows (Quesnel *et al*., 1998) .

A doe rabbits within all groups were fed 170 g diet/ doe daily, after insemination, during the stages of pregnancy where the energy requirements for the fetal growth are modest and the energy balance of the does is positive (Parigi-Bini *et al.,* 1990).

The rabbit does subjected to feed restriction before artificial insemination lead to an improvement in blood pictures and some blood serum constitutents ; liver and kidney functions; sexual and lipten hormones; fertility traits and milk yield and composition. This finding is in agreement with Hornick *et al*. (2000); Dal Bosco *et al.* (2003); Rommers *et al*. (2004b) and Cardinali *et al.* (2008).

Hy-Plus breed was imported from the outside, so we have to use it with the most profitable way by using it more than one productive year, subsequentaly reduce the cost of productivity and save currency.

Conclusively, it could be concluded that, fattened rabbit does characterized by low reproductive performance. Such problem could be solved by restricting feed. Using strong restriction regime (SR) within short period gave better in sexual hormons concentration and leptin levels in blood, also (SR) improving significant fertility and conception, kindiling rates, and recorded high increased in litter size and weight at birth and weaning. Milk yield and lactose of rabbit does were high than that of light restriction regime (LS).

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الأداء الفسيولوجى والتناسلى والإنتاجى لأمهات الأرانب الهاى بلس تحت تأثيرنظام التقنين الغذائى

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إستهدفت هذه التجربة دراسة تأثير نظام التقنين الغذائى على معدلات خصوبة إناث الأرانب السمينة، إستخدم فى هذه الدراسة عدد ٨٧ أنثى سمينة ناضجة من نوع هاى بلس ولدت قبل ذلك أكثر من مرة، عمرها فى حدود ١٤ شهراً، ووزنها ٤٦٨١±٤٢ جرام.

قسمت إناث الأرانب المستخدمة فى التجربة إلى ثلاثة مجموعات تجريبية متجانسة (٢٩ أنثى فى كل مجموعة). إستخدمت المجموعة الأولى كمجموعة ضابطة وتم تغذيت الامهات فيها على عليقة تجارية ١٥٠ جرام لكل أم يومياً، بينما غذيت المجموعتين الثانية والثالثة (المجموعات المعاملة) على نفس العليقة ولكن باتباع نظام التقنين الغذائى البسيط، أو التقنين الغذائى الشديد، على الترتيب. الإناث فى نظام التقنين الغذائى البسيط كانت تغذى على ١٢٠ جرام من العليقة يومياً ولمدة ١٤ يوماً قبل تلقيحها إصطناعياً، أما الإناث التى عوملت بنظام التقنين الغذائى الشديد كانت تغذى فقط على ١٠٠ جرام من العليقة يومياً ولمدة ٣ أيام قبل التلقيح الإصطناعى. ثم غذيت كل الأمهات فى كل المجموعات على ١٧٠ جرام علف يومياً بعد التلقيح الإصطناعى.

أوضحت النتائج أن وزن جسم إناث أرانب الهاى بلس السمينة فى أيام التلقيح، واليوم العاشر من الحمل وكذلك يوم الفطام تأثرت معنوياً (على مستوى ٥%) لنظام التقنين الغذائى، وكانت مرتبة ترتيباً معنوياً (على مستوى ٥%) تنازلياً فى المجموعة الضابطة، ثم مجموعة التقنين الغذائى الشديد، ثم مجموعة التقنين الغذائى البسيط، على الترتيب. فى حين أن أوزان المجموعات فى اليوم الـ ٢٠ من الحمل وكذلك يوم الولادة كانت مرتبة ترتيباً تنازلياً وغير معنوى فى المجموعة الضابطة، يليها مجموعتين التقنين الغذائى الشديد ثم البسيط، على الترتيب. صورة الدم وبعض مركباته متمثلة فى البروتين الكلى ومفرداته، وبعض الإنزيمات الدالة على نشاط الكبد والكلى لإناث أرانب هاى بلس السمينة تأثرت معنوياً (على مستوى ٥%) لنظام التقنين الغذائى، وكانت الأفضل وفى ترتيب تنازلي (على مستوى ٥%) كما سجلت

فى مجموعتين التقنين الغذائى الشديد ثم البسيط، ثم المجموعة الضابطة، على الترتيب. سجلت تركيزات الهرمونات الجنسية ومستوى هرمون اللبتين فى الدم أعلى قيم معنوية (على مستوى ٥%)، بينما تركيز هرمون اللبتين فى اللبن سجل القيم الأقل وبشكل غير معنوى فى أمهات الهاى بلس السمينة، فى مجموعتين التقنين الغذائى الشديدة، ثم البسيطة، ويليهم المجموعة الضابطة، على الترتيب. تأثرت معنوياً (على مستوى ٥%) معدلات خصوبة إناث أرانب الهاى بلس السمينة لنظام التقنين الغذائى، وكان كل من معدلات الحمل والولادة والإجهاضات، وكذلك عدد ووزن المواليد عند الميلاد وعند الفطام الأعلى معنوياً (على مستوى ٥%) نتيجة للتقنين الغذائى الشديد، ثم البسيط مقارنة بالمجموعة الضابطة، على الترتيب. وزن المولود الواحد عند الميلاد وعند الفطام لم يتأثر معنوياً بسبب المعاملة بالتقنين الغذائى، بينما إناث أرانب الهاى بلس السمينة والتى عوملت بنظام التقنين الغذائى البسيط سجلت معدلات نفوق خلفات خلال مرحلة الرضاعة وقبل الفطام، أعلى معنوياً (على مستوى ٥%) عن تلك المسجلة بواسطة الأرانب فى مجموعة التقنين الغذائى الشديد، ثم أرانب المجموعة الضابطة، على الترتيب. سجلت إناث أرانب الهاى بلس السمينة والمعاملة بالتقنين الغذائى الشديد أعلى قيم معنويه (على مستوى ٥%) لكل من محصول اللبن وسكر لاكتوز اللبن، يليها مجموعة التقنين الغذائى البسيط، ثم المجموعة الضابطة، على الترتيب، بينما نسب كل من بروتين ودهن ورماد اللبن لم تتأثر معنوياً بالمعاملة بالتقنين الغذائى لأمهات أرانب هاى بلس السمينة.

التوصية: ومن الدراسة نستخلص أن إناث الأرانب السمينة تتصف بإنحدار معدلات الخصوبة، وأنه يمكن تخفيف التأثيرات السلبية لسمنة إناث الأرانب على خصوبتها باستخدام نظام التقنين الغذائى.