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EFFECT OF BREED AND PARITY ON GROWTH PERFORMANCE, LITTER SIZE, LITTER WEIGHT, CONCEPTION RATE AND SEMEN CHARACTERISTICS OF MEDIUM SIZE RABBITS IN HOT CLIMATES

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Abstract: *This study aimed to investigate the differences among four medium breeds of rabbits (Rex, New Zealand White, California and Baladi Red) in productive performance and semen characteristics. Hundred twenty does, 7–9 months of age and 3–3.5 kg body weight from Rex, NZW, California, and Baladi Red. The numbers of 360 parities were analyzed to evaluate breeds effects. Traits studed were litter size and litter weight at birth, at14 days and at weaning. Mortality percentage from birth to weaning was calculated. Also, the analysis concerned 5120 ejaculates from 80 bucks from the 4 breeds of rabbits. The recorded traits were: pH, ejaculate volume, sperm motility, concentration, total number of spermatozoa per ejaculate, percentage of sperm normalcy and percentage of sperm abnormalities. The volume of each ejaculate was registered and an aliquot was separated for further analyses. Breed effect led to significant (P≤ 0.05) effect on litter size and litter weight at birth, 14 days and at weaning. Parities had significant (P≤ 0.05) effect on litter size and on litter weight at birth, 14 days and at weaning. California does recorded largest litter size and heaves litter weight at birth, at 14 days and at weaning. California does recorded significant higher conception rate (%), lower number of services per conception and lower mortality rate compared to the other breeds. Mean values of total ejaculate didn't differ (P>0.05) among breeds. California Bucks tended to have larger ejaculate volume, higher motility percentage, lower abnormal percentage and higher total live sperm compared to the other breeds.*

INTRODUCTION

Breed of rabbits considered as one of the factors, which may affect the productivity. The evaluation of domestic rabbit breeds for economic traits is necessary for commercial operations. Many investigators reported that breed had an effect on body weight and body weight gain of rabbits. Nunes and Moura (1985) found that the average of body weight for Norfolk, California and New Zealand White rabbits were 73, 87 and 78g at birth , 1674, 1607 at 1575g and 8 wk and 3363, 2758 and 2944g at 17 wk for the three breeds, respectively. Heimid (1988) found that the feed conversion ratio (g. feed/ g. gain) was 3.30, 3.34 and 3.97in "SPF" (French), New Zealand White and Californian rabbits, respectively.

Litter size is the most important economic character in rabbit production (Abou-Khadiga, 2004 and Nofal et al., 2005). Diversity of rabbit breeds offers opportunity to increase the efficiency of commercial meat production through crossing (Piles et al. 2004). Weaning mortality percentage of kit rabbits is of vital importance in commercial rabbit farming, where it plays a major role in determining the net financial income of the farms (Rashwan and Marai, 2000). With

the increase of litter size and decrease of mortality income becomes more elevated (Szendro et al., 1996). Litter weight at weaning is controlled by the number of kits survived at weaning (Risam et al. 2005). California rabbits are heavy and their growths make it a good meat rabbit and can be exploited, especially in crossbreeding (Lebas et al., 1986).

Many factors affect seminal traits and thus it is crucial to define suitable protocols to improve spermatozoa characteristics (Brun *et al.*, 2002). Hence, it is possible to produce more doses of semen with higher "expected" fertility and with less variability. Semen evaluation must provide information on the fertilizing ability of spermatozoa. The most relevant parameters correlated with the fertility rate are the number of spermatozoa inseminated and their motility, although the use of a single attribute is not sufficiently accurate to predict the fertilizing ability of the semen (Colenbrander *et al.*, 2003 and Lavara *et al.*, 2005). Semen production and quality depends on a great variety of management, breed, environmental and genetic factors: age, sexual preparations, season of collection, number of ejaculates collected and interval between collections (Alvarino, 2000). Concerning genetic factors, Vicente (2000 found differences between rabbits in semen characteristics but only Brun *et al.*, 2002) have estimated heterosis effects reporting significant and eminent values for concentration, mass motility and percentage of motile sperm per ejaculate. High temperatures and humidity in the summer can result in behavioral and physical changes in bucks that affect breeding and reproductive success. Changes after thermal stress can be observed on a semen evaluation include alterations in the shape of the sperm cell head and tailpiece. Signs of heat stress have been observed in bucks maintained in 32.22°C environments. Environmental temperatures of 37.78°C can be dangerous and may produce advanced signs of heat stress Finzi *et al.* (1994). There fore, the present study was conducted to study the evaluation of the productive performance and semen characteristics efficiency under the upper Egypt conditions for these breeds of rabbits is lacking.

MATERIALS AND METHODS

Experimental design:

Present study expressing the results of two experiments.

First Experiment

This study was carried out at the Experimental farm of Animal Production Department, Faculty of Agriculture, South Valley University, Qena during the period from May 2009 to October 2010. This study aimed to investigate the reproductive and productive performance of four medium size of rabbits (Rex, New Zealand White (NZW), California and Baladi Red) . Hundred twenty does (7–9months of age and 3000–3500g body weight) from Rex, NZW, California, and Baladi Red. Rabbits were divided into four equal groups. Red Baladi, Egyptian traditional breeds that, after their formation, have not followed a programmed of genetic improvement (Khalil, 1993). The numbers of 360 parities (3 parities x Hundred twenty does) were analyzed to evaluate breeds effect on productive and reproductive performance . Studded traits were litter size and litter weight at birth, at 14 days and at weaning. Also, mortality percentage was calculated. Does were re-mated second day post-partum. The litters were weaned at 28 day in the 1st, 2nd and 3rd parity. Rabbits were reared in semi-closed rabbit system, in which does were kept in individual cages (60×50×30cm Provided with nest boxes (40×30×27cm). Clean fresh water was available for all rabbits

by nipple drinker all time. All the experimental animals were reared under the same environmental and managemental conditions. Ambient air temperature ranged from 30 to 40^{0}c throughout the experimental period. Each breed fed *ad libitum* (Table, 1). Estimated according to Maertens et al. (1984) as described in Table 1. Chemical analyses of diets were done according to AOAC (1995).

Second Experiment:

This study aimed to investigate the differences among bucks in four medium size rabbit breeds [Rex, NZW, California and Baladi Red] in some reproductive performance and physical semen characteristics. A total number of 80 male (twenty bucks per genetic type) were used. After weaning the rabbits were housed in individual cages in the same room, with a photoperiod of 16 hours light/day and temperatures ranging from25.8 to 41.1°c, receiving ration and water *ad libitum* with a diet of commercial pellets. Composition of the pellets was 17.85% crude protein, 13.70% crude fiber and 3.10% ether extract. At fifth month of age bucks started the training period with artificial vagina. One ejaculated was collected per male weekly. At sixth month of age, they started production period. During 8 weeks, two ejaculates per male weekly were collected, with an interval of 30 minutes between them (Moce *et al.*, 2000). All ejaculates were stored at 37°C in a water bath until evaluation, non-later than 15 minutes after collection. Volume (ml) and pH of the ejaculate were determined by using a graduated tube and a pH-meter 507Crison, respectively. Immediately after collection, the amount of ejaculate volume (ml) and the spermatozoa concentration (number of sperms/ ml) were recorded by using a graduated tube and haemocytometer respectively. For evaluation of percentage of sperm motility drop of semen was examined under the low power of microscope using a hot stage at 37 °C. Progressive motility was estimated on a percentage score. Total and motile sperm output/ejaculate were calculated. All bucks were used for natural three weeks after the end to study the fertility rate of the different treatments. Environmental values are listed in Table 2, the stable air temperatures (AT,°C) ranged from 25.8 to 41.1°C. The mean of minimum AT was 25.9 °C, while the mean of maximum AT was 40.97°C. Relative humidity (RH, %) ranged from 6.8 to 43.5 % with a mean daily low of 12.53 % and a mean daily high of 38.57 %.

Statistical analyses:-

Analysis of variance was carried out using SAS (1989), Duncan Multiple range Test was used to compare the differences among means (Duncan, 1955).

RESULTS AND DISCUSSION

Productive and Reproductive Performance

Litter size:

Results of some productive and reproductive traits of four breeds rabbits does as affected by breed and parity are presented in Tables 3, 4 and 5. Data in Table 3 showed that average litter size at birth, at14 days and at weaning (28 day) for the different four breeds studied. The average litter size at birth as affected by breed varied from 6.77±0.20 and 7.63±0.32 N depending on the breed. Generally, New Zealand White gave significantly ($P \leq 0.05$) smallest litter size at birth. In addition, California gave significantly ($P \leq 0.05$) smallest litter size at 14 days and at weaning. The average litter size at birth as affected by parity varied between 7.34±0.53and 7.55±0.36 depending on the

breed. Parity effects led to no significant effect on litter size at birth, at 14 days and at weaning as shown in Table 3. No significant differences were detected in this respect between four breeds. The litter size at birth, at 14 and at 28 days in California breeds in the present study are in agreement with the result of De-Leon et al.(2002) and El-Maghawry et al.(1999). Litter size at 28 days in California breeds at the third parity recorded highest value compared with other breeds. These results agreed with those obtained by Zaky (2001) and Zerrouki et al.(2005). Also, reported Ahmed et al. (2005) The litter size at birth was in California recorded higher litter size at birth compared with Baladi Red and New Zealand White. Other workers found higher litter size at birth, at 14day and at weaning in New Zealand than California (Khalil ,1993; Pascual et al. 1996 and Abou-Khadiga, 2004). This may be due to high uterine capacity or greater conception rate (Argente et al., 2003). These results agreed with those obtained by Khalil and Afifi (2000). Generally, differences in litter size at birth breeds may be due to differences in conception rate and may be also due to the maternal effects determined by the number of mature, fertilized and established ova (Gad-Alla et al., 2005, Nofal et al., 2005 and Pannu et al.,2005).

Litter weight:

Breed had significant ($P \leq 0.05$) effect on litter weight at birth, at 14day and at weaning (28d) as shown in Table 4 . The highest values of litter weight at birth were recorded for Baladi Red (368±27g) followed by California (364±22g). While, the values of litter weight at birth for Rex, and New Zealand White were 357±25 and 351±25g, respectively. The highest values of litter weight at 14 day recorded for California (1525±49g) followed by New Zealand White (1494±63g), while those for Rex and Baladi Red (1450±69 and 1426±57g), respectively. The lowest values of litter weight at weaning were recorded for Rex 2057±16 g. Parity had significant ($P \leq 0.05$) effect on litter weight at birth while, breeds had no significant effect at 14 and 28 day of age (Table 4). Generally, California breed showed highest litter weight at birth, at 14 day and at weaning. These results agreed with those obtained by Seleem (2005). Litter weights of California results in the present study were similar to those of Prayaga and Eady (2002) **and** Reddy et al. (2003). Litter weight at birth and Litter weight at weaning for Rex were lower than California. California breed recorded significantly heavier weight than New Zealand White one in doe live weight. The results observed by Bedier et al. (1999) and Khader et al.(2001) at birth and by De-Paula et al. (1996); El-Maghawry et al.(1999) Afifi et al. (1992), Darwish et al. (1995) **and** Saleh et al.(2005) at weaning .

Reproductive performance:

Table 5 illustrated that conception rate of the different breeds. It can be observed that the California breed gave a significant ($p<0.05$) higher conception rate (92.2±4.56%) than all other breeds. The lowest conception rate (75.2±4.64%) was observed in Rex. At the same time there were no significant differences between the other breeds. This result was consistent with findings of De Leon *et al.*(2002). With advancement of parity and doe live body weight led to successful mating and at the same time increased ($p<0.05$) . The literature showed that significant effects of parity and live body weight of doe on conception rate (El-Maghawry et al.(1999) **and** Nicodemus et al.(2002) . These results agreed with those obtained by Gad-Alla et al. (2005), Nofal et al. (2005) **and** Pannu et al. (2005). Differences in litter size at birth breeds may be due to differences in ovulation rate and pre-implantation viability and may be also due to the maternal effects determined by the number of mature, fertilized and established ova (Rashwan et al., 1995). Also, Argente et al., (2003) reported that the differences in litter

size at birth may be due to high uterine capacity or greater ovulation rate.

Effect of breed on weaning mortality (%) illustrated significant ($P \leq 0.05$) as shown in Table 5. NZW and Rex breeds recorded the highest weaning mortality values while California breed showed the lowest percentages of weaning mortality. Similar results were observed by Zaky, (2001) and Abou-Khadiga (2004). Also, parity effects on weaning mortality (%) had no significant effect. These results agreed with those obtained by El-Maghawry (1993) and Bhasin and Singh (1995).

The mean value of some physical semen characteristics of the male rabbits of Rex, NZW, California and Baladi Red are shown in Table 6. The results indicated that most physical semen characteristics are significantly ($p<0.05$) affected by the breed. Average volume varied between 0.54± 0.03 and 0.62±0.03 ml depending on the breed. Generally, California bucks gave significantly ($p<0.05$) smaller ejaculate volume compared to other breeds. The average values for semen volume obtained are comparable with the range for other rabbit breeds as reviewed by Garcia-Tomas *et al* (2006) , Mehrez *et al.*1982) and Bicudo and Paschoal (1991). On the other hand Vicente (2000) gave higher average of semen volume (1.09±0.6) NZW bucks while Castellini *et al.* (2006) gave average of 0.65 and 1.03ml for NZW and California bucks respectively . In contrast, El-Masry *et al.*(1994) and Moce *et al.*(2000) found that ejaculate volume was higher in bucks NZW.

Results of the average motility percentage of sperms collected from breeds are shown in Table 6. Significant different were observed between breeds in the percentage of motility. The lowest sperm motility percentage was observed in Rex bucks, while California bucks gave significantly ($p<0.05$) higher sperm motility percentage compared with the other breeds studied . These results are in full agreement with those observed by Brun *et al.* (2004).

The average of sperm concentration in the ejaculates in collected from the different breeds during the experimental period is presented in Table 6. It was observed that California bucks gave significantly ($p<0.05$) higher sperm concentration compared with the other breeds studied , while it is apparent from these results that the Rex bucks had the lowest sperm cell concentration. California bucks gave 8.5%, 9.2% and 9.3% more sperm cell per ml higher than Rex, NZW and Baladi Red respectively. Values of sperm cell concentration in California bucks in the study were also found by Viudes *et al.* (1997).

Total sperm output per ejaculate (Table 6) produced by California bucks was observed to be significantly higher ($p<0.05$) than the other breeds, while Rex bucks gave the lowest sperm out put per ejaculate. California bucks gave 12.6, 8.5% and 8.5% more sperm cell per ml higher than Rex, NZW and Baladi Red bucks respectively.

The results in Table 6 indicated that the percentage of abnormal spermatozoa was higher in the semen produced by Rex bucks than other breeds. Such values were lower in all breeds than found by Moce *et al.*, (2005). The total number of live spermatozoa per ejaculate was lower in Rex bucks and Baladi Red bucks than other breeds.

Generally form the present study, the variability of semen characteristics in male rabbits is generally high (Moce *et al.*, 2005). However, the sperm traits of some genetic strains exposed to strict protocols of rearing (light, temperature, feed) and collection frequencies has shown lower variability within and between bucks Viudes *et al.* (1997), and Brun *et al.*, (2002 and and 2004) observed differences in semen characteristics for males from different genetic lines and from crossbred and purebred males. These differences

could be explained by differences in maternal genetic effects and the existence of heterosis for this trait (Garcia-Tomas *et al* (2006). From this experiment it can be concluded that breed had significant effect on ejaculate volume, individual motility, concentration and total number of spermatozoa per ejaculated.

Conclusively, it may be recommended that California doe rabbits had better litter size and weight than Rex NZW, Baladi Red. Breed effects were also found significant for ejaculate volume, individual motility, concentration and total number of spermatozoa per ejaculated

Table (1). Composition and chemical analysis of experimental basal diet of rations.

Items	%
Ingredients :	
Alfalfa hay	3.04.2
Soybean meal (44% CP)	12.5
Corn meal	22.5
Whole sunflower meal	7.0
Barley meal	14.0
Wheat bran	5.0
Beet molasses	1.2
Calcium carbonate	1.372
Calcium diphosphate	0.671
Sodium chloride	0.5
Dl-methionine	0.057
Premix (Zn-free)	1.0
Total	100.0
Calculated chemical analysis :	
Dry matter	89.20
Ash	8.80
Ether extract	5.30
Crude fiber	14.90
Crude protein	17.30
NFE	63.70
Digestible energy* MJ kg-1	10.90

* Estimated according to Maertens et al.(1984) as described in Table 1.

Table 2. Monthly variations in air temperature (AT,˚C) and relative humidity (RH,%) in the area of South Valley experimental animal farm during the period of study.

Months	AT, ˚C			RH, %		
	Min.	Max.	Mean	Min.	Max.	Mean
June	26	40.9	33.45	16.6	41.9	29.25
July	25.9	40.9	33.40	6.8	30.3	18.55
August	25.8	41.1	33.45	14.2	43.5	28.85
Average	25.9	40.97	33.43	12.53	38.57	25.55

Table 3. Least square means and standard errors (M ± S.E) of litter size at birth, at 14 days and at weaning as affected by breed, parities and interaction (BXP).

Items	Birth	14 days	28days
Breeds: (B)			
R	6.77±0.20b	4.82±0.29 b	4.51±0.64b
NZW	7.63±0.32a	5.19±0.63b	4.28±0.54b
C	7.23±0.19a	6.47±0.49a	5.62±0.71a
BR	7.18±0.46a	5.41±0.57 b	4.61±0.77ab
Significant	*	*	*
Parities : (P)			
P1	7.34±0.53a	5.66±0.37a	4.85±0.45a
P2	7.55±0.36a	5.61±0.18a	4.87±0.24a
P3	7.38±0.44a	5.56±0.41a	4.78±0.35a
Significant	Ns	Ns	Ns
Interaction(BX P):			
R XP1	6.73±0.46	4.78±0.41	4.47±0.37
R X P2	6.90±0.53	4.86±0.43	4.62±0.40
R X P3	6.68±0.59	4.76±0.43	4.45±0.40
NZW X P1	7.61±0.54	5.15±0.47	4.4±0.38
NZW X P2	7.69±0.59	5.29±0.48	4.18±0.43
NZW X P3	7.59±0.57	5.13±0.43	4.2±0.42
C X P1	7.20±0.56	6.71±0.49	5.58±0.47
C X P2	7.30±0.49	6.21±0.42	5.72±0.46
C X P3	7.19±0.62	6.51±0.40	5.56±0.41
BR X P1	7.15±0.47	5.37±0.59	4.87±0.51
BR X P2	7.35±0.55	5.51±0.52	4.11±0.49
BR X P3	7.04±0.46	5.35±0.50	4.85±0.42
Significant	*	*	*

Least square means ± S.E in the same column in each items with different superscript differ significantly at ($P \leq 0.05$).

B=breeds P=parities

R=Rex, NZW =New Zealand, C= California, BR= Baladi Red.

* = significant at $P \leq 0.05$ and NS = insignificant

Table 4. Least square means and standard errors (M ± S.E) of litter weight at birth, at 14 days and at gm as affected by breed, parities and interaction (BXP).

Items	Birth	14 days	28days
Breeds: (B)			
R	357.18±25b	1450.70±69 b	2057.30±164c
NZW	351.21±25b	1494.00±63ab	2530.00±154ab
C	364.33±22a	1525.00±49a	2757.11±171a
BR	367.66±27a	1426.00±57 b	2323.12±177b
Significant	*	*	*
Parities : (P)			
P1	356.11±23.34b	1506.30±62.14	2488.11±122.47
P2	373.30±22.47a	1526.51±71.22	2497.63±124.19
P3	351.83±25.23b	1501.00±65.27	2468.33±131.32
Significant	*	NS	NS
Interaction(BX P):			
R XP1	342±21.02	1442±69.43	2044±124
R X P2	359±23.41	1490±73.18	2098±128
R X P3	338±24.27	1420±73.18	1994±124
NZW X P1	346±23.91	1490±62.41	2566±126
NZW X P2	363±24.28	1504±78.33	2520±128
NZW X P3	344±26.07	1488±73.18	2504±127
C X P1	360±23.02	1520±61.07	2752±121
C X P2	374±24.30	1537±71.23	2769±113
C X P3	358±25.71	1518±77.6	2750±136
BR X P1	362±23.32	1422±60.41	2319±123
BR X P2	379±24.22	1430±69.43	2333±129
BR X P3	360±24.17	1420±69.43	2317±121
Significant	*	*	*

Least square means ± S.E in the same column in each items with different superscript differ significantly at ($P \leq 0.05$).

B=breeds P=parities

R=Rex, NZW =New Zealand, C= California, BR= Baladi Red .

* = significant at $P \leq 0.05$ and NS = insignificant

Table 5. Least square means and standard errors (M±S.E) of number of services per conception, conception rate % and mortality % as affected by breed, parities and interaction (BXP).

Items	No of services per Conception	Conception rate %	Mortality (%)
Breeds: (B)			
R	1.84±0.042	75.2±4.64b	33.29±3.20b
NZW	1.81±0.033	88.5±5.71a	37.11±3.30b
C	1.73±0.054	92.2±4.56a	22.27±3.31a
BR	1.87±0.049	88.5±6.64a	31.62±4.52b
Significant	NS	*	*
Parities : (P)			
P1	1.98±0.51	77.4±6.04b	28.46±4.4
P2	1.83±0.55	91.5±7.21a	26.76±4.1
P3	1.87±0.53	88.2±5.36a	29.76±4.3
Significant	NS	*	NS
Interaction(BXP):			
R XP1	1.843±0.71	72.2±4.35	33.29±5.20
R X P2	1.811±0.76	74.5±6.32	31.51±4.30
R X P3	1.730±0.64	73.2±5.61	29.37±3.31
NZW X P1	1.871±0.66	85.7±6.24	37.11±3.30
NZW X P2	1.843±0.72	87.2±6.33	30.33±3.20
NZW X P3	1.811±0.73	88.3±6.32	30.21±4.20
C X P1	1.730±0.75	89.2±5.66	25.27±5.31
C X P2	1.871±0.63	93.5±5.44	22.66±3.20
C X P3	1.843±0.65	91.2±7.41	20.56±3.20
BR X P1	1.811±0.59	81.5±1.71	33.52±3.52
BR X P2	1.730±0.54	89.6±6.52	30.25±4.20
BR X P3	1.871±0.62	87.3±6.51	31.32±4.33
Significant	NS	*	*

Least square means ± S.E in the same column in each items with different superscript differ significantly at ($P \leq 0.05$).
B=breeds P=parities
Mortality percentage (%) form birth to weaning.
R=Rex, NZW =New Zealand, C= California, BR= Baladi Red.
* = significant at $P \leq 0.05$ and NS = insignificant

Table(6): Means(±SE) for some physical semen characteristics of Rex, New Zealand White (NZW),California and Baladi Red rabbit bucks as affected by breed.

Semen characteristics	Breed			
	Rex	NZW	California	Baladi Red
Ejaculate volume(ml)	0.54± 0.03 b	0.57± 0.04b	0.62±0.03a	0.56±0.04b
Sperm motility (%)	51.91± 2.14b	54.55± 2.11b	59.89±2.32a	55.41±1.98b
Sperm concentration (10^6/ml)	415.10±10.11b	416.72± 9.16b	454.11±11.40a	423.34±12.11b
Total sperm out put (10^6/ejac)	224.11± 6.85b	237.53± 7.44b	281.54±11.21a	237.00±10.15b
Motile sperm /ml ($x10^6$)	215.47±7.31c	227.32±6.11bc	271.96±9.11a	234.57±9.79b
Motile sperm /ejac ($x10^6$)	116.33±6.19c	129.57±4.29b	168.61±7.66a	131.37±6.51b
Live spermatozoa (%)	81.11± 0.61b	88.80± 0.77a	87.90±0.74a	83.10±0.92b
Dead spermatozoa (%)	18.87± 0.66a	12.20± 0.66b	12.10± 0.88b	16.90±0.99a
Abnormal spermatozoa (%)	24.33± 1.11a	21.34± 0.95b	19.56±0.68b	20.28 ±0.76b

a ,b,c means in the same row followed by different letters are significantly different ($p<0.05$) .

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الملخص العربي

تأثير النوع وترتيب الولادة على أداء النمو وعدد ووزن الخلفات ومعدل الاخصاب وبعض خصائص السائل المنوي في الأرانب متوسطة الوزن بالمناطق الحارة

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أجريت هذه الدراسة بمزرعة الإنتاج الحيواني-كلية الزراعة- جامعة جنوب الوادي بقنا خلال المدة من شهر مايو ٢٠٠٩-اكتوبر٢٠١٠ لدراسة تأثير النوع وترتيب الولادة على أداء النمو وعدد ووزن الخلفات ومعدل الاخصاب وبعض خصائص السائل المنوي في أربع سلالات من الحجم المتوسط (الركس-النيوزيلندي -الكاليفورنيا-البلدي الأحمر) المر باه بصعيد مصر وقد اشتملت الدراسة على عدد ٣٠أنثى وعدد ٢٠ ذكر من كل نوع من السلالات المذكورة. تم تسجيل حجم ووزن البطن عند الميلاد وعند أربعة عشر يوما وعند الفطام (٢٨يوم) ونسبة النفوق قبل الفطام بالأضافة إلى تأثير عدد مرات التلقيح المخصب ومعدل الإخصاب . كما تم جمع السائل المنوي مرة كل أسبوع طوال فترة التجربة من كل ذكر على حدة بمعدل قذفتين في كل مرة وأجريت الاختبارات الطبيعية على قذفات السائل المنوي لدراسة خصائصه (الحجم-الحيوية-التركيز-نسبة الشواذ-الحي والميت). كما تم قياس وزن الحيوانات ومعدل النمو بصفة دورية طوال فترة التجربة وفى نهاية التجربة تم تلقيح عدد من الإناث لتحديد نسبة الخصوبة في كل سلالة.

اتضح من الدراسة أن إناث الكاليفورنيا أعطت أعلى عدد من المواليد واعلي وزن في المواليد واقل نسبة نفوق مقارنة بباقي السلالات المستخدمة في الدراسة. وكانت أقل هذه السلالات هي الركس وكان تأثير النوع معنوى عند مستوى (5٠.٠%)على حجم ووزن البطن عند الميلاد. كما تلاحظ أن اعلي معدل إخصاب تم الحصول عليه في إناث لكاليفورنيا مقارنة بباقي السلالات المستخدمة في الدراسة وهذا يعكس سبب أعطاء سلالة لكاليفورنيا اعلي عدد من المواليد و اعلي وزن في المواليد.كما اتضح من الدراسة عدم وجود فروق معنوية في معدل الوزن بين السلالات. أما بالنسبة لخصائص السائل المنوي لذكور الأرانب الكاليفورنيا فقد أعطت حجم للقذفة(0.62 سم) بينما حجم القذفة في ذكور الأرانب النيوزيلندي (٠.٥٧.سم) مقارنة بسلالة الركس التي أعطت حجم للقذفة(٠.٥٤ سم) بينما أعطت ذكور البلدي الأحمر حجم للقذفة(٠.٥٦ سم)وكانت الفروق معنوية بين سلالة الكاليفورنيا وباقي السلالات المستخدمة في الدراسة عند مستوى٥%. أما بالنسبة لتركيز الحيوانات المنوية/مل في السائل المنوي للذكور الكاليفورنيا 454.11 مليون حيوان منوي/مل بينما سلالة البلدي الأحمر 423.34 مليون حيوان منوي/مل مقارنة بسلالة الركس 415.10 مليون حيوان منوي/مل وذكور النيوزيلندي الأبيض 416.72مليون حيوان منوي/مل. في حين كان تركيز الحيوانات المنوية في القذفة لذكور الأرانب الكاليفورنيا (281.54) مليون حيوان منوي/ القذفة لذكور النيوزيلندي الأبيض (237.53)مليون حيوان منوي/ القذفة بينما ذكور البلدي الأحمر (237.00) مليون حيوان منوي/ القذفة المليون مقارنة بذكور الركس (224.11) مليون حيوان منوي/ القذفة وكانت الفروق عالية المعنوية عند مستوى معنوية٥% حيث أعطى ذكور الكاليفورنيا اعلي نسبة تركيز /مل أو القذفة. وكانت النسبة المئوية للحركة الكلية للحيوانات المنوية في ذكور الكاليفورنيا 59.89 % مقارنة بذكور الركس 51.91% وذكور النيوزيلندي الأبيض54.55 بينما ذكور البلدي 55.41% وكانت الفروق بين السلالات غير معنوية عند مستوى ٥%. أما نسبة الشواذ والميت من الحيوانات المنوية كانت أعلى في ذكور الركس وكانت الفروق بين سلالة الكاليفورنيا وباقي السلالات بالدراسة معنوية عند مستوى معنوية٥% . كما تلاحظ أن اعلي معدل إخصاب تم الحصول عليها من ذكور الكاليفورنيا مقارنة بباقي السلالات المستخدمة في الدراسة.