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A PRELIMINARY STUDY ON PERFORMANCE OF SOME PRODUCTIVE TRAITS IN NEW ZEALAND WHITE AND CALIFORNIAN RABBITS, UNDER EGYPTIAN ENVIRONMENTS

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SUMMARY

A study was carried out on the foundation stock of New Zealand White (N.Z.W.) and Californian (Cal.) breeds at the Rabbitry of National Rabbit Project, Faculty of Agriculture, Zagazig University. The study aimed to throw some light on the performance of some productive traits: litter size, litter weight, mean bunny weight at birth and weaning and preweaning mortality, as affected by breed, parity, doe weight at conception, litter size at birth and month of kindling. The important results obtained were as follows:

1. The breed showed significant effects on bunny weight at weaning and preweaning mortality.
2. Parity showed significant effects on birth litter size in N.Z.W. and preweaning mortality in Cal. rabbits.
3. Weight of doe at conception significantly ($P < 0.05$) affected average bunny weight at weaning in N.Z.W. rabbits. The average bunny weight was higher from does weighing 3.0 to 3.5 Kg.
4. Litter size affected significantly ($P < 0.01$ or $P < 0.05$) litter weight and average bunny weight either at birth or at weaning, as well as, preweaning mortality.
5. Litter size averaging 7-9 showed the lowest preweaning mortality.
6. Month of kindling showed significant effect ($P < 0.01$ or $P < 0.05$) on most of the traits studied.

INTRODUCTION

In Egypt, the N.Z.W. and Cal. as commercial meat rabbit breeds were recently introduced. However, the information about the two forementioned breeds under the prevailing environmental conditions in their new locality, are scanty.

The present study aimed to provide more information about some of the available strains of New Zealand White and Californian breeds, under the environmental conditions prevailing in Sharkia Governorate.

MATERIAL AND METHODS

The present work was carried out on the foundation stock of New Zealand White and Californian rabbit breeds in the National Rabbit Project, Faculty of Agriculture, Zagazig University, Egypt.

The foundation stock of New Zealand White breed was imported from France and that of the Californian was imported from U.K. through Al-Barari Investment Company, in 1985.

The rabbits were reared in a conventional confined and windowed building, not heated and naturally ventilated with sided electric fans in summer. Bucks and does were lighted 14-16 hours per day. Each breeding rabbit had individual universal wire cage. The grower rabbits were raised in collective cages in the same building. Does were kept in flat at deck wire cages in rows back to back batteries ended with those for bucks parallel to rows for grower batteries and provided with feeders and automatic drinkers. Mothers and youngs were fed with the same formulated mash rations in which minimum rate of crude proteins is 15% and maximum rate of crude fibre is 14% and minimum rate of fat is 2%. There was also mineral and vitamin mixtures supplement. The clean fresh water was provided all the time. All the flock was kept under the same managerial and environmental conditions.

Mating was carried out between purebred mates within each breed (one buck for five does as mating ratio). The data were collected including: litter size, litter weight, mean bunny weight and preweaning mortality, till 35 days. The effect of breed, parity, weight of doe at conception, litter size at birth and month of kindling on each of the forementioned traits at birth and at weaning was studied. Statistical analysis was carried out according to **Snedecor and Cockran (1982).**

RESULTS AND DISCUSSION

1. Litter size:

Means of litter size at birth and at weaning (at 5 weeks of age) were insignificantly higher in N.Z.W. than in Californian rabbits (7.05 and 5.59 vs 6.70 and 5.52 young, respectively) (Table 1). **Lahiri (1984) and Lukefahr et al. (1984)** reported average 6.9 and 10.9 young, respectively, in N.Z.W. at birth, while **Trojan and Mach (1980) and Partridge et al. (1981)** reported 6.6 and 9.1 young, respectively, in Cal. rabbits at the same age.

The coefficient of variation of litter size was higher at weaning than at birth in both breeds. **Lukefahr (1982)** reported similar results (22.5% at birth vs 27%).

Parity showed significant effect on litter size only in N.Z.W. at birth. However, **Rollins et al. (1963)** reported significant differences among parities in litter size at birth and at weaning and **Kalinowski and Rodulph (1977), Afifi et al. (1982) and Emara (1984)** found that the effect of parity on litter size did not show any consistent trend. Insignificant effects were also reported by **Casady et al. (1962), Hulot and Matheron (1981) and Emara (1982)** at birth, and by **Afifi et al. (1982) and Lukefahr et al. (1983)** at weaning.

Table 1 . Litter size of New Zealand White and Californian rabbits at birth and weaning as affected by some factors, under Egyptian environment.

assification	At Birth				At weaning			
	New Zealand		Californian		New Zealand		Californian	
	Means + S.E.	C.V%	Means + S.E.	C.V%	Means + S.E.	C.V %	Means + S.E.	C.V%
eed	7.05 ± 0.17a	31.26	NS 6.70 ± 0.32a	23.8	5.59 ± 0.14a	34.2	NS 5.52 ± 0.34a	37.9
rity	*		N.S.		N.S.		N.S.	
1st	6.60 ± 0.21a	29.28	6.89 ± 0.48	36.90	5.73 ± 0.23	37.06	5.31 ± 0.63	43.09
2nd	7.53 ± 0.32b	32.49	5.81 ± 0.63	50.07	5.94 ± 0.24	28.07	5.79 ± 0.48	31.20
3rd	7.52 ± 0.46ab	29.69	7.38 ± 0.84	33.20	5.79 ± 0.43	32.82	5.55 ± 0.72	43.70
ight of doe at nception (gm):	N.S.		N.S.		N.S.		N.S.	
< 3000	6.77 ± 0.26	29.81	6.50 ± 0.70	39.91	5.69 ± 0.32	37.44	5.18 ± 0.73	46.33
> 3000-3500	7.06 ± 0.26	30.91	6.67 ± 0.42	35.71	5.51 ± 0.25	35.69	5.40 ± 0.48	40.55
> 3500	7.40 ± 0.38	33.13	6.87 ± 0.80	52.17	5.60 ± 0.26	27.12	5.93 ± 0.46	30.19
nth of kindling:	**		*		N.S.		N.S.	
nuary	6.38 ± 0.22a	26.60	5.11 ± 0.88a	52.17	5.32 ± 0.30	40.27	6.00 ± 0.85	31.18
bruary	7.13 ± 0.38ab	36.20	6.59 ± 0.63ab	39.46	5.50 ± 0.31	33.52	5.00 ± 0.63	45.46
rch	7.81 ± 0.43bcd	28.80	7.62 ± 0.93b	44.06	5.73 ± 0.38	31.50	5.38 ± 0.63	32.89
ril	8.91 ± 0.50c	18.10	7.83 ± 1.06ab	33.70	6.80 ± 0.55	25.75	5.50 ± 0.83	37.70
y	6.85 ± 0.46abd	30.06	8.33 ± 1.06b	31.90	5.88 ± 0.33	22.30	7.00 ± 0.56	17.50
ne	6.38 ± 0.59ab	27.40	6.30 ± 0.85ab	43.02	5.38 ± 0.71	37.13	5.33 ± 0.88	49.60

ans bearing different subscripts within the same classification, differ significantly ($P < 0.05$).

$P < 0.01$ * $P < 0.05$ N.S. = Not significant.

The live weight of doe at conception did not affect the litter size neither at birth nor at weaning in the two breeds studied (Table 1). The high coefficient of variation averaging more than 22.3% for litter size in the present study, either at birth or at weaning may be due to differences in litter losses which happen at birth or during suckling. The high variability in litter size helps in improvement through selection, although **Hulot and Matheron (1980)** reported that litter size is likely to be slow in improvement by selection, since it is a quantitative character of considerable complexity and is influenced, to a large degree, by many environmental factors.

The effect of month of kindling on litter size was found to be significant ($P < 0.01$ or $P < 0.05$) in both breeds, at birth. **Khalil (1986)** showed that month of kindling effects at birth were highly significant ($P < 0.01$ or $P < 0.01$) in Bauscat and Giza white breeds. However, **Casady et al. (1962), Broeck and Lampo (1975) and Lukefahr et al. (1983a)** found insignificant effect at the same age. At weaning, the average litter size varied insignificantly from 5.32 to 6.80 in N.Z.W. and 5.0 to 7.0 in Cal. rabbits among months similar to that reported by **Lukefahr et al. (1983). Khalil (1986)** attributed the differences in litter size at weaning of Egyptian rabbits to differences in litter losses during suckling period which occurred in litters born at different months.

2. Litter weight:

Means of litter weight at birth and at weaning (at 5 weeks of age) were 425.90 and 3484.61 grams for N.Z.W. and 403.91 and 3095.31 grams for Cal. rabbits, respectively (Table 2). However, the differences between the two breeds were not significant. **Lahiri (1984) and Lukefahr et al. (1984)** recorded that the litter weight averaged 367 and 609 gm in N.Z.W., while **Neidzwiadak (1979) and Lukefahr et al. (1983b)** found that the same trait averaged 405 and 468 gm, in Cal. rabbits.

Results given in Table 2 showed that litter weight increased as parity advanced up to the 3rd one at birth in N.Z.W. similar to that observed by **Khalil (1980)**. However, the differences in litter weight among parities in the two breeds were not significant. The present results agreed with that reported by **Afifi et al. (1976)** and disagreed with those of **Casedy et al. (1962)** who found that the average weaning weight of litters produced in the 1st parity was the heaviest one and the total litter weight at weaning decreased as parity advanced. Litter weights of does with light live weights at conception differed insignificantly from those of heavier ones (Table 2).

The average weight of litter at birth and at weaning increased ($P < 0.01$) with the increase of litter size at birth in both breeds (Table 2). The obtained results were in fairly agreement with those of **El-Khishin et al. (1951), Rao et al. (1977) and Afifi and Emara (1984)** regarding the increase of litter weight at birth. However, it

Table 2 . Litter weight of New Zealand White and Californian rabbits at birth and weaning as affected by some factors, under Egyptian environment.

Classification	At Birth				At weaning			
	New Zealand		Californian		New Zealand		Californian	
	Means ± S.E.	C.V%	Means ± S.E.	C.V%	Means ± S.E.	C.V%	Means ± S.E.	C.V%
	N.S				N.S.			
Breed	425.90 ± 9.15a	28.0	403.04 ± 19.54a	39.5	3484.61 ± 99.72a	34.3	3095.32±198.78a	43.70
Parity:	N.S.		N.S.		N.S.			
1st	410.11 ± 12.16	27.87	393.93 ± 23.83	32.00	3434.33 ± 150.72	38.18	3221.54±383.38	42.96
2nd	440.17 ± 16.95	29.57	362.00 ± 43.17	53.31	3579.17 ± 140.49	27.08	3343.57±411.95	46.08
3rd	449.70 ± 22.15	23.64	457.00 ± 54.02	42.60	3377.37 ± 290.69	37.87	2648.18±330.92	41.49
Weight of doe at conception (gm)	N.S.		N.S.		N.S.		N.S.	
< 3000	411.32 ± 12.12	22.09	400.00 ± 29.56	27.34	3352.22 ± 176.36	35.25	2774.09±379.28	45.12
> 3000-3500	432.72 ± 14.44	28.04	402.66 ± 25.86	36.61	3611.27 ± 163.10	35.68	3190.06±311.22	43.90
> 3500	434.17 ± 19.32	28.93	408.04 ± 42.17	49.60	3426.67 ± 176.89	30.46	3204.67±361.31	43.97
Litter size at birth:	**		**		**		**	
1-3	217.09 ±14.73a	22.92	151.15 ± 21.69a	51.56	2535.00 ± 163.71a	19.57	1180.00±428.18a	72.57
4-6	343.68 ± 9.81a	20.83	370.31 ± 25.61b	27.66	2987.38 ±149.41a	31.51	2796.66±335.52ab	35.99
7-9	477.24 ± 9.12b	17.17	478.75 ± 13.00c	15.48	3799.19 ± 152.34b	35.44	3505.54±254.57b	38.49
>10	543.95 ±20.23b	16.36	575.00 ± 48.75d	28.74	3745.36 ± 259.30b	25.62	2868.00±346.33b	26.57
Month of kindling:	**		*		N.S.		N.S.	
January	408.07 ±14.90a	27.38	326.11 ±60.28acd	55.45	3632.50 ± 202.54	39.59	3934.00±422.30	23.62
February	409.02 ±17.30a	28.33	383.53 ±32.63b	34.89	3334.72 ± 184.14	33.13	3398.85±506.50	53.65
March	491.48 ±27.06b	28.63	491.67 ± 59.59a	42.42	3260.45 ± 199.10	28.70	2590.63±451.25	48.77
April	435.00±23.96ab	19.28	518.33 ± 50.18c	24.20	3874.00 ± 257.60	21.28	2375.83±256.70	27.01
May	441.75±25.46ab	25.94	505.00 ± 38.76d	19.19	3711.56 ± 281.12	30.30	3628.00±268.37	16.27
June	393.50±33.83a	24.08	390.00 ± 52.44e	43.03	2751.25 ± 287.00	29.12	2823.33±413.37	43.92

Means bearing different subscripts within the same classification, differ significantly ($P < 0.05$).

** $P < 0.01$ * $P < 0.05$ N.S. = Not significant.

contradicted with those of **Afifi and Emara (1984)** at weaning. The high variation in litter weight in the present study may be a good tool for improvement through selection.

Litter weight at birth increased gradually from January (408.07 gm) to March (491.48 gm) in N.Z.W., and from (383.53 gm) to April (518.33 gm) in Cal. breed. The litter weight reached the peak in March and April. The differences among months in litter weights were highly significant ($P < 0.01$) in N.Z.W. and significant ($P<0.05$) in Cal. rabbits. Similar findings were reported by **Lukefahr et al. (1983a)** with straitbred and crossbred rabbits. However, **Afifi and Emara (1984)** found insignificant effects of month of kindling on litter weight at birth. At weaning, the average litter weight ranged between 2751.25 gm in June and 3874.00 gm in April in N.Z.W. breed and ranged between 2590.63 gm in February and 3628.0 gm in May in Cal. rabbits, but the differences were not significant. The present results disagreed with the findings of **Lukefahr et al. (1983a)** and **Afifi and Emara (1984)** who found that the effect of month of kindling on litter weight was highly significant ($P < 0.01$), at the same age.

3. **Mean bunny weight**:

The bunny weights were 62.52 and 63.04 gm at birth and 652.14 and 589.28 gm at weaning in N.Z.W. and Cal., respectively (Table 3). The difference, due to breed at weaning was significant.

The mean bunny weight at birth and at weaning for both breeds of the present study showed higher coefficients of variation than those of 10.9% reported by **Lukefahr (1982)** at weaning at 4 weeks of age in N.Z.W. and Flemish Giant rabbits and their reciprocal crosses. That suggests the possibility of improving bunny weight through selection.

Parity did not show any significant effect on bunny weight either at birth or at weaning, in both breeds. These results were in agreement with those of **Afifi et al. (1982)** and contradicted with those reported by **Afifi et al. (1973 and 1982)** who found significant ($P < 0.05$ and $P < 0.01$) effects of parity at birth and at weaning on bunny weight.

Weight of doe at conception of > 3.0 - 3.5 Kg showed significant effect on bunny weight at weaning in N.Z.W. rabbits. This may suggest that higher bunny weight at weaning could be obtained from the does weighing 3.0 - 3.5 Kg, in N.Z.W. rabbits. **Khalil (1986)** considered that the mean bunny weight at weaning to be the most effective component affecting litter weight in rabbits.

The average individual bunny weight at birth or at weaning decreased ($P < 0.05$ and $P < 0.01$) with the increase of litter size at birth, similar to that reported by **Veng (1950) and Afifi et al. (1973).**

Table 3 . Bunny weight of New Zealand White and Californian rabbits at birth and weaning as affected by some factors, under Egyptian environment.

Classification	At Birth				At weaning			
	New Zealand		Californian		New Zealand		Californian	
	Mean ± S.E.	C.V%	Means ± S.E.	C.V%	Means ± S.E.	C.V%	Means ± S.E.	C.V.%
	N.S.				*			
Breed	62.52 ± 1.02a	21.3	63.04 ± 1.71a	22.5	652.14 ±15.70a	28.9	589.28 ± 27.94b	32.20
Parity:	N.S.		N.S.		N.S.		N.S.	
1st	63.97 ± 1.58	20.03	61.34 ± 3.32	28.72	658.26 ± 18.62	24.61	660.52 ± 54.92	29.93
2nd	60.72 ± 1.92	24.76	65.35 ± 3.04	20.96	629.27 ± 25.18	27.61	569.51 ±52.60	34.17
3rd	61.68 ± 2.30	17.88	62.72 ± 2.58	14.82	605.47 ± 36.53	26.55	532.48 ± 60.69	37.61
Weight of doe at conception (gm):	N.S.		N.S.		*		N.S.	
> 3000	61.26 ± 1.47	18.00	66.96 ± 5.22	28.87	607.46 ± 23.82a	26.27	608.72 ± 73.33	39.75
< 3000-3500	65.00 ± 1.73	22.30	62.48 ± 2.51	22.87	698.86 ± 27.25b	30.80	604.86 ± 39.20	29.16
< 3500	60.09 ± 2.04	22.08	61.42 ± 2.08	16.23	625.49 ± 25.93ab	24.46	554.24 ± 44.45	31.28
Litter size at birth:	**		**		**		*	
1-3	78.35 ± 4.87a	20.52	75.64 ± 4.73a	22.49	924.44 ± 60.14a	19.52	720.62 ± 183.31a	50.87
4-6	66.29 ± 1.68a	18.46	65.08 ± 4.03b	24.78	690.03 ± 23.46b	21.42	663.35 ± 49.04a	22.18
7-9	60.86 ± 1.23b	18.72	59.44 ± 1.40cb	13.46	595.74 ± 14.96c	22.35	571.54 ± 32.26ab	29.92
< 10	50.57 ± 2.09b	18.15	52.87 ± 4.11 c	21.80	578.12 ± 44.14c	28.25	450.19 ± 42.52b	20.78
Month of kindling:	**		N.S.		N.S.		**	
January	64.56 ± 1.48ab	17.15	60.59 ± 2.28	11.30	690.44 ± 21.51	22.02	755.16 ± 99.14a	33.50
February	60.21 ± 2.12a	23.95	63.70 ± 4.45	28.67	628.69 ± 26.89	25.66	714.87 ± 60.09a	30.26
March	66.98 ± 3.16b	24.56	66.06 ± 4.47	23.69	609.73 ± 44.35	34.18	461.35 ± 57.82bc	35.09
April	49.90 ± 2.88c	20.24	56.92 ± 3.20	14.07	591.68 ± 42.80	23.15	476.30 ± 70.10cd	36.79
May	66.38 ± 2.57ab	17.40	62.51 ± 3.08	12.33	634.78 ± 35.49	22.36	532.54 ± 61.56cd	25.43
June	63.62 ± 1.71ab	7.51	62.90 ± 2.68	13.63	554.50 ± 62.85	31.85	586.25 ± 49.40d	28.01

Means bearing different subscripts within the same classification, differ significantly (P < 0.05).

** P < 0.01 * P < 0.05 N.S. = Not significant.

The effects of month of kindling were highly significant ($P < 0.01$) on bunny weight at birth in N.Z.W., and at weaning for Cal. rabbits, similar to that reported by **Lukefahr (1982).**

4. **Preweaning mortality**:

The preweaning mortality averaged 28.0% in N.Z.W. and 51.9% in Cal. breed. The difference was highly significant (Table 4). However, the mortality rate values recorded were found to be 7.1% (**Chen et al., 1978**) and 27.0% (**Partridge et al., 1981**) in N.Z.W., and 26.1% in Cal. at four weeks of age. The results of the present work show higher viability of N.Z.W. than Cal. and suggests that further investigations are needed to define the reasons of such high values.

Parity showed no significant effect on preweaning mortality in N.Z.W. similar to that reported by **Khalil and Afifi (1986)** in Buscat and Giza rabbit. In Cal. rabbits, preweaning mortality decreased significantly ($P < 0.05$) from 76.5% in the 1st parity to 36.8% in the 3rd one, similar to that reported by **Rouvier et al. (1973), Afifi et al. (1982) and Lukefahr et al. (1983b).**

The increase of weight of doe at conception was accompanied by insignificant increase in preweaning mortality. The different categories of litter size showed no definate trend in preweaning mortality. However, the differences in preweaning mortality due to these two factors were highly significant. The present results agreed with those of **Ragab and Wanis (1960) and Partridge et al. (1981).** However, **Khalil and Afifi (1986)** found that the litter size did not affect the preweaning mortality.

Month of kindling affected significantly the preweaning mortality in the two breeds studied. **Ragab and Wanis (1960) and Nossier (1970)** reported that the lowest mortality rate upto weaning age was for rabbits born during January and February.

In conclusion, the results discussed in the present work either on the production traits studied or the factors affecting their performance may show that the two breeds studied could be raised successfully for broiler rabbit production under the Egyptian environment. In addition, the high variation of the traits studied may give chance to improve the two breeds through selection under the prevailing environmental conditions in Sharkia Governorate. However, further investigations should be carried out on the productive and reproductive traits of these two specific breeds to confirm the above results.

Table 4 . Preweaning mortality (Percent) as affected by breed, parity, weight of doe at conception, litter size at birth and month of kindling, under Egyptian environment.

Classification	New Zealand		Californian
	Mortality %		Mortality % +
Breed	28.0a	**	51.9b
Parity:	N.S.		*
1st	23.5		76.5a
2nd	35.5		37.3b
3rd	27.2		36.8cb
Weight of doe at conception (gm):	N.S.		N.S.
< 3000	28.9		33.2
> 3000 - 3500	22.5		57.1
> 3500	36.7		56.1
Litter size at birth:	**		**
1-3	11.2a		83.2a
4-6	34.8b		62.3a
7-9	20.9ab		27.4b
> 10	61.7c		75.2a
Month of kindling:	*		*
January	19.4ac		57.5a
February	36.2b		43.5ab
March	36.0b		56.8a
April	33.9ab		29.2ab
May	30.5ab		22.1b
June	6.2c		20.9b

Means bearing different subscripts within the same classification, differ significantly ($P < 0.05$).

\+ Preweaning mortality percent was obtained by the retransformation from Arc-Sin to original scale.

** ($P < 0.01$) * ($P < 0.05$) N.S. = Not significant.

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