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Performance of New Zealand White does as affected by different environmental factors.

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Abstrat

Data of 132 does were analysed to study the effects of doe, parity, month, year of kindling, litter size at birth and doe weight on litter traits. The reproductive traits were; litter size and weight at birth (LSB, LWB) and at weaning (LSW, LWW), gestation length (GL) and pre-weaning litter mortality (PM). Effect of parity was found to be a significant source of variation in GL and PM while month of kindling gave the same results in LWB, LWW, GL, and PM. Also doe and year of kindling affected significantly LWB and GL. With the exception of GL and PM there was a highly significant effect of LSB on all litter traits studied.

Key words : Rabbit, performance, environmental factors.

Introduction

One of the possible solutions to the problem of an increasing shortage of meat production in Egypt is through developing animal production utilizing small ruminant and semi-ruminant species. The rabbit falls under the latter group with the capacity to convert both high concentrate feeds and roughages with increased efficiency when compared with large animal species. Wilson (1968) estimated the existing production level and the biological ceiling for rabbit production as 15 and 48 offspring per year, respectively, Which means that there exists a potential of almost 69 % yet to be aimed at.

However, rabbit production has not yet received the same attention as other classes of farm livestock. Rabbit production is characterized by many factors; early sexual maturity, high prolificacy, short gestation period, short generation interval, elevated number of progeny produced by the doe/year, rapid growth rate, high capacity to convert protein in the roughage into meat with low percentage of lipid and cholesterol and the high quality of its fur. Rabbit feed could be considered very reasonable in price if compared with that of poultry. It could contain more fiber percentage, consequently much cheaper ingredients could be involved. Moreover, rabbits can utilize high forage diets largely consisting of ingredients which are not used directly for human consumption, El-Madhagi (1990).

Materials and Methods

Records on 430 litters of New Zealand White rabbits were collected from the experimental rabbitry of APRI Sakha station at Kafr El-Sheikh, during the period from October, 1991, to July 1993. 80 does were available during the year 1991/1992 while 52 does were used during 1992/1993. Does were randomly assigned to 43 mating bucks avoiding full and half-sibs and sire daughter matings as much as possible. Animals were fed on pelleted feed of 17 (%) crude protein, 12 (%) crude fiber and 2500 K.cal. (D.E). Berseem (Trifoluim alexandrinum) was offered ad-lib. to the animals.

A mixed model was used to analyse the data. Fixed factors included in the model were those of parity (P), month of birth (M), year of kindling (R), season of birth (S), litter size at birth (LSB) and the regression on doe weight at mating. Traits studeid were litter size and weight at birth and at weaning (LSB,LWB,LSW,LWW), gestation length (GL) and pre-weaning litter mortality (PM), according to tow models (1) and (2) being:

$Y_{ijklmo} = \mu + D_i + P_j + M_k + R_l + S_m + b_L(x_{ijklmo}-x) + E_{ijklmo}$ (1)

and $Y_{ijklmno} = \mu + D_i + P_j + M_k + R_l + S_m + LSB_n + b(x_{ijklmno}-x) + E_{ijklmno}$ (2)

Where :

$Y_{ijklmno}$ = the observation on the $_{ijklmno}$ th litter;

μ = overall mean, common element to all observations;

D_i = a random effect of the i th th doe;

P_j = a fixed effect of the j th parity; (j = 1,2,3,4,and >5)

M_k = a fixed effect of the k th month of birth;

R_l = a fixed effect of the l th year of kindling;

S_m = a fixed effect of the m th season; (m = 1.st season begin from 22/9 to 21/12 (automn), 2.nd from 22/12 to 22/3 (winter), 3.rd from 22/3 to 21/6 (spring) and the 4.th from 22/6 to 21/9 (summer));. Effect of season was not included in the model when analysing preweaning litter mortality.

LSB_n = a fixed effect of the n th litter size at birth;

b_L = the linear regression coefficient of the observation of the ijklmo and ijklmno th. litter on its doe weight at mating.

$E_{ijklmno}$, E_{ijklmo} a random deviation of the o th. litter of the i th doe. It includes all other effects not specified in the model.

The Harvey (1987) mixed model computer program was utilizes in the analysis of data.

Results and Discussion

1. Non genetic factors :-

1.1. Parity effect :-

Table 1. shows that parity had a non-consistent trend and a non significant effect on litter traits (LSB,LSW,LWB,LWW). While it was observed that parity was a significant source of variation in (GL and PM). The results indicated that GL increased consistently with the advance of parity. On the other hand, PM had a decreasing trend with its advance. It was observed that the 4.th and 5.th parities were the highest for LWW and LSW or PM when compared with the litters of other parities. These finding are in agreement with those of (El-Tawil et al, 1971; Khalil and Mansour, 1987; Khalil et al, 1988; Oudah, 1990; Hilmy, 1991; Youssef, 1992).

1.2. Month of birth :-

Litter traits varied with month of birth and exerting a significance effect on (LWB, LWW, GL and PM). This might be due to the changes in the quality of green fodders during the breeding season and changes in climatic conditions (Khalil and Mansour, 1987). It was observed that the largest and heaviest LSW and LWW were recorded during October and January while the largest LSB was recorded during January and July and the heaviest LWB was recorded during April (Table 1). LWW, LSW tended to be high when kindling took place in the early month of the year, while LSB and LWB showed an oposite trend. On the other hand, GL increased with advance of month of birth. These results agree with the other Egyptian workers (Chany et al, 1969; El-Tawil et al,1971; Khalil and Mansour, 1987; El-Maghawry et al, 1988; El-Maghawry, 1990; Afifi et al, 1992) found the same trend on PM.

1.3. Year of kindling :-

Reproductive traits varied In their response to the effect of year of kindling. Its effect was non-significant for all traits with the exception of LWB and GL. GL and LWB in general dereased with the advance of year of kindling. Year differences in litter traits may be due to differences in climatic, management, feeding, labour, diseases and changes in the genetic makeup from year to another. This result is in agreement with those reported in Egypt (Afifi and Emara, 1987; Khalil and Mansour, 1987; Hilmy, 1991; Youssef, 1992).

1.4.Season :-

Litter traits varied with season which showed a non-significant effect on all reproductive traits (Table 1.) This result is in agreement with those reported in Egypt (Such et al, 1978; Ibrahim, (1985); Yamani et al, 1991 on LSB; Khalil, 1993 on LSW and LWW).

1.5.Doe weight at mating :-

Differences in most of the litter traits due to doe weight in the present study were non-significant with the exception of LSB and LWB, such that both LSB and LWB increased with the increase of DWT. This might be due to the available number of implantation sites and uterine capacity of the doe, while LSW, LWW and PM decreased with the increase of DWT. This agreed with the results of (Afifi et al, 1980 on LSB and LSW; Yamani et al, 1991).

1.6.Litter size at birth :-

In general, LWB, LSW, LWW increased as LSB increased with a consistent and highly significant trend while GL and PM did not show any consistent trend due to the variability in LSB, such finding is in agreement with those of El-Tawil (1971), Lahiri and Mahajan (1982) and Hilmy (1991).

2. Doe effect :-

Differences in most of the reproductive traits due to doe effects were non-significant with the exception of LWB and GL; Table (2). These differences which are related to pre-weaning litter traits are considered as a doe traits. Thus the doe contributes strongly by the genes transmitted and its maternal environment depending on ovulation rate, ova wastage, implantation sites, uterine capacity and intra uterine environment. It is in agreement with those of different workers (Khalil, 1986, Khalil and Mansour, 1987; Emara, 1982; Hilmy, 1991; Youssef, 1992).

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Table 1. Least-Sq. Means, standard errors (SE.) and test of significance of factors affecting litter traits in New Zealand White rabbits.

Indpendent variable	N.of records	Litter traits						
		LSB	LWB	LSW	LWW	GL	+PM %	
		LS.M ± SE.	LS.M ±SE	LS.M ± SE.	LS.M ± SE.	LS.M ± SE.	NO.	LS.M
Parity		n.s	n.s	n.s	n.s	****	*	
1.st	125	6.45 ± 0.30	374 ± 12	4.58 ± 0.26	1685 ± 111	30.5 ± 0.2	140	41.8
2.nd	75	6.44 ± 0.34	355 ± 13	4.15 ± 0.29	1534 ± 126	30.7 ± 0.3	130	43.5
3.rd	76	6.71 ± 0.35	377 ± 14	4.52 ± 0.31	1687 ± 133	31.2 ± 0.3	90	40.2
4.th	61	6.25 ± 0.36	379 ± 14	4.19 ± 0.31	1773 ± 134	31.4 ± 0.3	49	16.9
>5.th	22	6.77 ± 0.49	379 ± 18	4.52 ± 0.43	1695 ± 185	32.1 ± 0.4	21	09.2
Month		n.s	***	n.s	*	****	****	
October	17	6.26 ± 0.86	365 ± 30	5.27 ± 0.75	2326 ± 327	29.9 ± 0.6	18	00.9
November	66	6.11 ± 0.62	411 ± 22	4.26 ± 0.54	1688 ± 236	30.7 ± 0.4	73	31.3
December	40	6.05 ± 0.55	362 ± 20	4.43 ± 0.48	1656 ± 209	30.1 ± 0.4	59	58.0
January	36	7.00 ± 0.60	350 ± 22	5.12 ± 0.53	2024 ± 230	31.9 ± 0.4	51	30.2
February	28	6.73 ± 0.62	348 ± 23	4.89 ± 0.55	1728 ± 241	31.6 ± 0.4	34	26.9
March	47	6.53 ± 0.45	405 ± 17	4.89 ± 0.39	1853 ± 171	31.5 ± 0.3	49	31.4
April	54	6.02 ± 0.56	417 ± 20	4.59 ± 0.49	1678 ± 214	31.2 ± 0.4	61	18.4
May	18	6.38 ± 0.67	398 ± 24	4.33 ± 0.59	1543 ± 256	30.8 ± 0.5	32	41.0
June	23	6.20 ± 0.58	360 ± 21	3.30 ± 0.51	1194 ± 220	31.6 ± 0.4	21	54.0
July	30	7.98 ± 0.99	311 ± 35	2.85 ± 0.87	1057 ± 377	32.5 ± 0.7	32	36.8
Year		n.s	***	n.s	n.s	*****	n.s	
1991	45	6.36 ± 0.49	394 ± 18	4.57 ± 0.43	1687 ± 185	33.1 ± 0.4	68	11.0
1992	189	6.76 ± 0.26	344 ± 10	4.23 ± 0.21	1688 ± 092	30.9 ± 0.2	233	30.6
1993	125	6.45 ± 0.34	379 ± 13	4.37 ± 0.30	1649 ± 128	29.5 ± 0.3	129	49.5
Season		n.s	n.s	n.s	n.s	n.s		
1.st	108	6.90 ± 0.55	343 ± 20	4.28 ± 0.49	1661 ± 211	31.2 ± 0.4		
2.nd	103	6.43 ± 0.42	373 ± 16	3.96 ± 0.36	1657 ± 157	31.2 ± 0.3		
3.rd	116	7.33 ± 0.41	379 ± 15	4.32 ± 0.36	1607 ± 155	31.9 ± 0.3		
4.th	32	5.43 ± 1.03	396 ± 36	5.01 ± 0.91	1774 ± 395	30.5 ± 0.7		

Table 1. Continued.

Indpendent variable	N.of records	Litter traits						
		LSB	LWB	LSW	LWW	GL	+PM %	
		LS.M ± SE.	LS.M ±SE	LS.M ± SE.	LS.M ± SE.	LS.M ± SE.	NO.	LS.M
LSB			****	****	****	n.s		n.s
< 3	27		169 ± 16	2.20 ± 0.38	1043 ± 163	31.2 ± 0.3	24	29.9
4	20		271 ± 19	3.11 ± 0.46	1253 ± 198	31.1 ± 0.4	33	18.3
5	418		325 ± 14	4.41 ± 0.33	1859 ± 143	31.6 ± 0.3	51	17.0
6	57		399 ± 13	4.40 ± 0.29	1611 ± 125	31.2 ± 0.3	69	24.8
7	82		396 ± 12	4.67 ± 0.28	1732 ± 120	31.2 ± 0.2	101	35.4
8	69		436 ± 13	5.60 ± 0.29	1958 ± 124	31.0 ± 0.3	76	26.6
9	38		489 ± 15	5.15 ± 0.35	1821 ± 150	31.0 ± 0.3	52	45.6
> 10	25		555 ± 17	5.58 ± 0.41	2119 ± 179	31.0 ± 0.3	24	36.8
DWT		****	***	n.s	n.s	n.s		n.s
		0.001 ± 0.0003	0.04 ± 0.01	-0.00002 ± 0.0003	-0.03 ± 0.13	0.0004 ± 0.0002	-0.0007	

+ The arcsin transformed values were decoded to the original scale.
n.s = non-significance, * = P<0.05, ** = P<0.01 and < *** P< 0.0001.

Table 2. Estimates of doe effects (δ^2 D) and remainder (δ^2E.)of random componant of variance for litter traits of New Zealand White rabbits.

Traits	δ^2 D.		δ^2 E.	
	Birth	Weaning	Birth	Weaning
Litter size	3.82 M(1)	2.55 M(2)	3.20	2.43
Litter weight	5862.1 ***	475635.05	3816.59	459641
GL		2.16 ***		1.45
PM		686.73		644.64

*** P< 0.001