EVALUATION OF SOME RABBIT BREEDS AND THEIR CROSSES FOR PRE-WEANING MORTALITIES UNDER EGYPTIAN ENVIRONMENT

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ABSTRACT

The mortality rate from birth to weaning in New Zealand White, Californian and Rex rabbits as well as their two-way crosses was investigated. Data on 63 litters of rabbits were analyzed to evaluate the effect of genotype, crossbreeding, male line, female line, season of birth, parity and litter size at birth on pre-weaning mortality rate. The effect of genotype and crossbreeding was significant (P<0.05), however; the effect of parity and litter size at birth was highly significant (P<0.01). The pure Californian, New Zealand White and Rex rabbits had similar performances, although there were significant variations among other genotypic groups. Male and female lines as well as season of birth were not important sources of variation. Crossbred litters exceeded the purebreds in their survival rate from birth to weaning as the mortality rate in crossbreds was 18.61% versus 27.80% in purebreds. As the parity advanced, the preweaning mortality rate was decreased to be 7.02% in the 6th parity. Moreover, as the litter size at birth increased, the preweaning mortality rate was increased to reach its maximum value (40.15%). Rabbits born during winter and spring seasons had lower, but not significant, mortality rate than those born during autumn and summer.

INTRODUCTION

The preweaning mortality rate is a critical factor in determining the efficiency of rabbit production. It means the number of young lost from birth to weaning in relation to the total number of litter. The larger the number of young that doe kindles and weans, the greater the likelihood of profitability. Preweaning losses in rabbits may be affected by the breed (Numes et al., 1985; El-Maghawry et al., 1988; Rastogi, 1988; Zimmermann et al., 1988 and Matheron and Dolet, 1990). Crossbreeding was found to have infulence on survival rate of rabbits (Coudert and Brun, 1987; Afifi and Emara, 1988; Cherkashchenko and Gugushvili, 1989; Afifi and Khalil, 1990 and Ozimba and Lukefahr, 1991).

Lukefahr, et al (1983) and Torres and Pla (1988) found that mortality rate was higher in litters reared by New Zealand White than those reared by Californian dams. Investigations on the effect of parity on survival rate of rabbits revealed that mortality rate decreased as parity sequence advanced to a definite parity then increased thereafter (Khalil, 1980and Afifi and Khalil, 1990). Season of kindling may be associated with variations in preweaning losses of young rabbits (Afifi and Khalil, 1990; Ferraz *et al.*, 1991and Gour *et al.*, 1992). Moreover, litter size at birth is directly related to mortality rate from birth to weaning (Khalil et al., 1987 and Afifi and Khalil, 1990). This work was carried out to study the factors assumed to affect preweaning mortality rate in rabbits raised under Egyptian environments.

MATERIALS AND METHODS

The data set utilized in the present study was from a population of rabbits belongs to the Rabbit Research Center of Animal Husbandry Department, Faculty of Veterinary Medicine, Alexandria University. Data were collected on 63 litters from 47 does of New Zealand White, Californian and Rex breeds. The rabbits were housed in wire cages inside a well-ventilated building, which provided protection from rain and sun. Rabbits were fed concentrate diet containing 16.71% crude protein, 12.9% crude fiber and 9.76% total ash. In addition, berseem hay was offered to the animals ad libitum daily. Fresh water was continuously available from automatic valves. Does were mated in a complete three-breed diallel crossbreeding design to produce all possible purebred and crossbred combinations. Within hours after kindling the number of young was recorded for each doe. Nest boxes were checked daily and the dead animals were removed and recorded. At the age of 30 days litter were weaned and their number were recorded for each doe.

Preweaning mortality rate was calculated for each litter as follows:

$$\text{Mortality rate} = \frac{\text{No. of young born - No. of young weaned}}{\text{No. of young born}} \times 100$$

Records of the percent of preweaning litter losses were subjected to arcsin transformation before being analyzed in order to approximate normal distribution (Damon and Harvey, 1987).

The general linear model procedure of the statistical analysis system (SAS, 1987) was utilized to analyze the obtained data based on the following model:

$Y_{ijklmno} = \mu + A_i + B_j + C_k + D_l + E_m + F_n + G_o + e_{ijklmno}$

Where:

Y = an observed value.

μ = overall mean

A_i = fixed effect due to breed (i= 1,2 and 3 i.e. New Zealand White , Californian and Rex).

B_j= fixed effect due to male line (j= 1,2 and 3 i.e. New Zealand White male line, Californian male line and Rex male line) .

C_k= fixed effect due to female line (k=1,2 and 3 i.e. New Zealand White female line, Californian female line and Rex female line).

D_l= fixed effect due to purebred versus crossbred (l= 1 and 2 i.e. purebreds and crossbreds).

E_m = fixed effect due to season of kindling (m= 1, 2,3 and 4 i.e. winter, spring summer and autumn).

F_n= fixed effect due to parity (n= 1,2,3,4,5 and 6 i.e. 1st, 2nd, 3rd, 4th, 5th and 6th parities).

G_o = fixed effect due to litter size at birth (o = 1, 2 and 3 i.e. litter size of 1-4, 5-8 and more than 8 kits/litter).

$E_{ijklmno}$ = the random error.

RESULTS AND DISCUSSION

The least squares analysis for different factors affecting preweaning mortality are presented in Table (1). Genotypic group differences were significant, the highest preweaning mortality rate was observed in New Zealand White rabbits (34.40 %), while the lowest rat (6.41 %) was observed in Rex x New Zealand White crosses (Table 2) . Similar results were reported by Zelink and Granat (1973), Lukefahr et al. (1984), Nunes et al. (1985) and Afifi and Khalil (1990). On the other hand, El-Sayed (1980) working on Bouscat and Giza White rabbits found no significant effect genotype on viability of rabbits.

Neither the breed of sire (male line) nor the breed of dam (female line) had significant effect on preweaning mortality. The lowest rate was 20.43 % for Californian male line compared to that for Rex male line (21.81 %) and New Zealand White male line (24.95 %).

Moreover, the lowest preweaning mortality rate (19.12 %) was observed for New Zealand White female line compared to that observed for Californian female line (23.00 %) and Rex female line (25.09 %). Similar results were recorded by Ponce-de-Leon and Menchaca (1985). Moreover, Ferraz et al.(1991) found that the mortality rate from birth to weaning was not statistically affected by the breed, however; there was a trend of higher mortality rates in New Zealand White female lines.

Crossbreeding was found to have a significant effect ($p<0.05$) on preweaning mortality rate. The crossbred rabbits had lower mortality rate (18.61 %) compared to that of purebreds (27.80 %) as presented in Table(2). Similar results were obtained by Coudert and Brun (1987) and Ozimba and Lukefahr (1991). Variations in litter losses during suckling might be due to differences in postnatal maternal ability and milk production during this early stage of life which was reflected on the vigor of young rabbits. On the other hand, Afifi and Emara (1988) reported that crossing did not increase survival rate in rabbits.

The effect of season of birth on preweaning mortality was non-significant. The lowest mortality rate occurred for the young rabbits born during winter season (15.98 %), while the highest rate was observed in rabbits born during autumn(33.06 %). Afifi and Khalil (1990) reported that litters born during winter season showed the lowest preweaning losses (21.2 %), while those born during autumn had the highest losses. Similar observations were recorded by Lukefahr et al.(1983) and Gour et al. (1992) who did not find an effect of season of birth on survival of rabbits. On the other hand, Ferraz et al (1991) observed lower mortality rates occurred in warm/humid season and the highest mortalities occurred in the cold/dry season and suggested some system that makes the environment warmer should be provided to avoid high mortality rates observed in cold season.

The preweaning mortality rate varied significantly ($P<0.05$) from one parity to another, but in general it decreased as parity sequence advanced after the third parity reaching its minimum value at the 6th parity (7.02%). This could be attributed to the improvement in the care of does with her young and increase of lactation yield with advance of parity sequence (McNitt and Lukefahr, 1990). Similar observations were recorded by Rouvier et al. (1973), Mowlem (1977), Khalil (1980) and Afifi and Khalil (1990). However, Ferraz et al. (1991) concluded that the parity of doe is not an important source of variation for preweaning mortality.

Litter size at birth was found to have a highly significant effect ($P<0.01$) on preweaning mortality rate. The preweaning litter losses increased with the increase of litter size at birth. Rabbits born in litters of 1-4 kits had the lowest mortality rate (13.41%) compared to those born in litters of 5-8 kits (21.09%) and more than 8 kits\litter (40.15%). Similar results were also obtained by Khalil (1980), Afifi and Emara (1984) who indicated that for different breeds the preweaning litter losses increased with the increase of litter size at birth. However, Khalil et al. (1987) and Afifi and Khalil (1990) showed that preweaning litter losses increased with the increase in litter size but the differences were not significant.

From the present results the following conclusions could be observed:

1. The preweaning mortality rate did not differ significantly among California, New Zealand White and Rex rabbits, however, significant variations were observed among other genotypes.
2. Crossbreeding may be considered a useful practical method for improving survival.
3. Parity of doe and litter size at birth was important sources of variation for preweaning mortality.
4. Season of birth had no significant effect on preweaning mortality rate.

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Table (1): Least squares analysis of variance in transformed data of preweaning mortality rate.

S.O.V.	D. F.	Mean Square
Genotype	8	279.716*
Male line	2	85.739
Female line	2	54.689
Purebred vs crossbred	1	564.352*
Season of birth	3	254.300
Parity	5	689.712**
Litter size at birth	2	1009.609**
Error	19	98.734

S.O.V. = Source of variation
D.F. = Degrees of freedom
* = Significant at level of $P<0.05$
** = Significant at level of $P<0.01$