THE RELATIONSHIP BETWEEN PREVIOUS LITTER SIZE AND POST WEANING WEIGHT FOR THOSE BORN IN THE CURRENT KINDLING.

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Abstract -Data on 6531 growing rabbits belonging to closed line of rabbit (N) which originated and was developed essentially out of New Zealand White rabbit. The experimental lasted for eleven consecutive years of production from 1982 -1992. The data subjected to three litter intervals (LI) which mean the number of days between successive (under study - former) kindling of the same doe, 1st level- 28 till 38 days, 2nd level- 39 till 71 days and 3rd level- ≥ 72 days. Body weight at 8 and 12 weeks of age were analyzed with LI and number born alive in previous kindling (NBAP) as a factor of variation, using linear model techniques (Analysis of variance and regression). The effects of LI of the doe on growth performance of her progeny were of small magnitude and non significant. The results suggested that the intensive production scheme, which included the shorter interval between successive (under study - former) litters, increased the number of parturitions per doe per year without altering body weight for the growing rabbits. The growth performance at the marketing age of the rabbits born in the current litter are nearly independent on the number born alive in previous litter.

INTRODUCTION

For meat production in rabbits there are several traits of economic importance such as body weight, daily gain and feed efficiency (ROE *et al.*, 1977; ZIMMERMANN *et al.*, 1988). In this respect, LUKEFAHR *et al.* (1990) reported that commercial producers should have heavy litters to market as their basic production goal. Several investigators have reported on size inheritance in rabbits (LEBAS and MATHERON, 1982; BLASCO *et al.*, 1983; AFIFI and EMARA, 1984; KHALIL *et al.*, 1987; KOSBA and ABO EL-EZZ, 1988; FERAZ *et al.*, 1991; MOURA *et al.*, 1991; MCNITT and LUKEFAHR, 1993). They indicated that there are many different genetic and environmental factors influencing body weight (e.g. breed, year of birth, month of birth, sex, parity, litter size, ...etc). These factors determine most of the variability in these traits. They also concluded that these factors must be considered by the researchers in the analysing their rabbit data. With the respect to the effect of interval between litters and number born alive in the previous kindling, few available studies were reported in literature. Harris *et al.* (1982) reported that, when rabbits readily mated one day after kindling and with gestation being only 31 days, the litter interval could be shortened, so that each doe could potentially produce 11 litter per year. It is recommended to commercial rabbit producers that doe culling could feasibly be practised on litter interval to increase litter productivity per year (LUKEFAHR *et al.*, 1984). In this respect, some authors (SZENDRO *et al.*, 1984; PARTRIDGE *et al.*, 1984; MENDEZ *et al.*, 1986) found that the individual gains and litter weight gain were not adversely affected in the groups mated immediately after parturition. The present study was undertaken to investigate some factors (LI and NBAP) associated with body weight in meat rabbits.

MATERIAL AND METHODS

Population

Data of the present study were collected at the nucleus breeding farm ZIKA (Schweizerhof, Untergröningen, Germany) spreading over eleven consecutive years of production from 1982 to 1992. A closed line of rabbits (N) was included in the investigation. This line originated and was developed essentially out of New Zealand White breed.

Housing

During the whole period of investigation the rabbits were housed in windowed, environmentally controlled houses. After weaning, the growing rabbits were raised in collective cages (8 per cage to 8 weeks of age, after that 4 per cage) so that the group size effect on body weight was reduced. All the flock was kept under the same managerial and environmental conditions. Breeding animals and youngs were fed with the same formulated pellet rations, in which minimum rate of crude protein is 16% and maximum rate of crude fibers is 14%. Minerals and vitamin mixtures were given as supplement in the ration. The clean fresh water was available to the rabbits all the time. A minimum temperature of 14°C was maintained during the winter (optimum 18°C). The relative humidity was 60% ± 10%. Fresh air circulated in the houses by using exhaust fans. Broad spectrum fluorescent bulbs were used to provide 14 hours light per day, 4 watt / m^2. Manure was collected in deep pits and removed twice a week in winter and in summer three times a week.

Reproductive management

The females were first inseminated at a mean age of 121 days, whereas the mean age at parturition ranged from 153 to 443 days. The breeding schedule allowed for a maximum of 10 litters produced per doe. The doe was inseminated within the first few days after kindling using artificial insemination with previously prepared fresh semen. All insemination were made at random with the only restriction pertaining to close relative. does were palpated 18 days post insemination to detect pregnancy. Those which failed to conceive were reinseminated at the next insemination date which repeated every 33 days for the same doe group. Does which were not pregnant 3 times consecutively were eliminated. During the pre-weaning period, unrestricted access for the litters to food and water was allowed. Litters were weaned at the mean age of 28 days. At weaning, the young rabbits were removed from the doe's cages. Each tested kit was individually ear-tagged. Young does were added to the herd as needed to replace those lost by death and by culling.

Statistical procedures

Best linear unbiased estimation (BLUE) is the method most frequently used in animal breeding for estimation of fixed effects (WEIGEL *et al.*, 1991). To drive BLUE of the fixed effects, least squares procedures and the type III methods described by statistical analysis system (SAS version 6.03) was used. Evaluation of the approximate significance of the effects was performed from the analysis including only fixed effects. Significance of the effects were tested at level $P < 0.05$ (*) and $P < 0.01$ (**) with the appropriate F statistic. Values of probability higher than 5% were considered to be non significant.

Data for body weight at 8 and 12 weeks of age were analysed with LI_p, $b1(NBAP - \bar{X})$ and $b2(NBAP(LI)_p - \bar{X})$ as a factors of variation. Where:

- LI_p fixed effect of the p^{th} litter interval (1st level- 28 till 38 days, 2nd level- 39 till 71 days and 3rd level- ≥ 72 days).
- b1 overall linear regression coefficient for number born alive in previous litter.
- b2 overall linear regression coefficient for number born alive in previous kindling nested within P^{th} LI.

The effects of LI and NBAP on body weights were obtained from fixed linear model included year of birth, month of birth, sex, parity number, gestation length, litter size at weaning, lactation length, candling-conception interval, number born alive in the next delivery (as a linear covariate) and age of animal at weighing (as a linear covariate), to adjust mean body weight deferences for these effects.

The first litter has not been taken into consideration to be able to find out the influence of the preceding litter interval.

RESULTS AND DISCUSSION

6531 records from growing rabbits were used to study the effect of the interval between successive kindling (under study - former) on individual body weight at 8 and 12 weeks of age (Figure 1). The analysis of variance (Table 1) show that the effects of litter interval of doe on postweaning weight of her progeny were of limited magnitude and non significant. Similar to the present results, Harris *et al.* (1982) found no significant differences in litter weights at 21 and 28 days of age between rabbits kindled by doses of 1 and 14 days rebreed schedule.

The present results may give a general indication that the intensive reproduction scheme, which included the shorter interval between successive litter (under study - former) increased the number of parturitions per doe per year without altering body weights for growing rabbits.

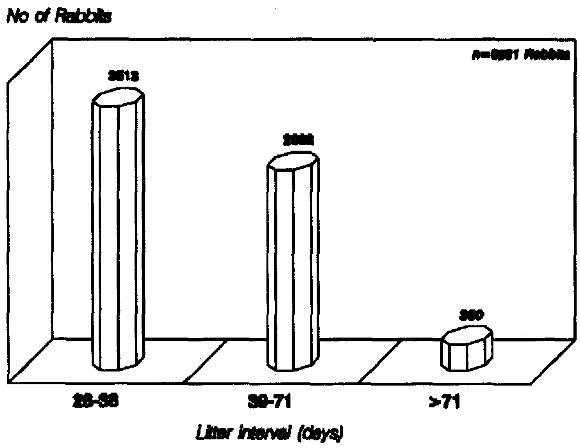
Table 1 : Tests of significance for factors affecting body weight at 8 and 12 weeks of age

S.O.V	Body weight at 8 weeks	12 weeks
LI	NS	NS
NBAP	*	NS
NBAP(LI)	NS	NS

Table 2 : Regression coefficients and standard errors for body weights at 8 and 12 weeks in the current litter on number of kits born alive in previous litter.

	Body weight at 8 weeks (g)	12 weeks (g)
NBAP	**-2.2 ± 1.1**	-1.2 ± 1.4
	P < 0.05	Non significant

Figure 1 : Frequencies of growing rabbits by litter intervals.



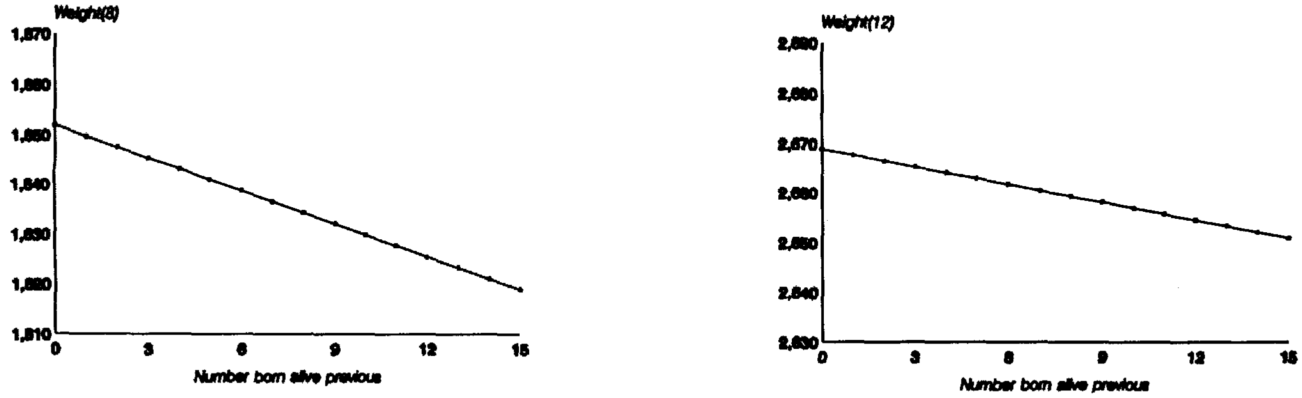
Results obtained here show that number of kits born alive in the previous parturition had a significant relationship ($P \leq 0.05$) with body weight at 8 weeks of age. Whereas, no significant relationship was found for this covariate and body weight at 12 weeks of age. Table 2 presented the regression coefficients of number born alive in former litter in relation to body weights for rabbits born in the current litter. It is apparent from these results that there is a significant negative dependent relationship ($P \leq 0.05$) for this covariate and body weight at 8 weeks of age (i.e. individual body weights of growing rabbits born to doe which had 5 kits born alive in previous litter were 2.2 gram lighter than those kindled by does which had 4 kits born alive in former parturition.

At 12 weeks of age, although individual body weights were not significantly associated by number of kits born alive in the former litter ($P > 0.05$) they decreased in average for 1.2 gram per one kit (born alive) more in previous litter.

Figure 2 graphically represents the relationship between differences in body weight of rabbits born in the current litter and the number born alive in the former one. However, the dependent relationship for this covariate on postweaning weight decreased with the advantage of age. On the other hand, this relationship has not yet been noticed or reported in the available literature.

Finally, these results may lead to the conclusion that body weight of growing rabbits at marketing age are nearly independent on the number born alive in previous litter.

Figure 2 : Regression coefficients and standard errors for body weights at 8 and 12 weeks in the current litter of kits born alive in previous litter



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