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EFFECT OF SEASON AND OF PARTURITION ORDER ON MORTALITY RATE AT BIRTH AND IN THE NEST.

Gualterio L.*, Valentini A.*, Bagliacca M.**
*Istituto di Zootecnia, Università della Tuscia, 01100 Viterbo, ITALY
**Cattedra Zoocolture, Università di Pisa, 56100 Pisa, ITALY

INTRODUCTION

The total productivity of a rabbitry depends on many factors, among which the interval between deliveries, the litter size and the mortality rate from the day of birth to slaughtering age are the most important factors. In particular, the losses during the suckling period represent the largest percentage of the total observed mortalities and, apart from specific genetic or pathological causes, these mortalities can be influenced by the characteristics of doe and litter and by different breeding techniques. In fact, birth weight, litter size, order and frequency of parturitions, season of birth, ambient temperature, quality and management of the nest have been assumed to influence the suckling mortality rate /Roustan 1980/ /Cabrero Saenz and Brulls Bosom 1981/ /Coudert 1982/ /Delaveau 1982/ /Harris 1982/ /Harris et al. 1983/ /Stephan et al. 1984/ /Szendro and Barna 1984/ /Verga et al. 1984/ / Castellò 1984/ /Battaglini et al. 1986/ /Torres et al. 1986/.

The birth mortality rates are often confused with the early mortality; in fact in rabbitries the first control of the nest is often carried out two or three days after delivery /Roustan 1980/ and moreover most of the cited authors described the nest mortality rate as an overall value from the day of birth to weaning. For these reasons the influence of certain factors (such as season, age of doe, expressed as number of litters produced, and litter size) on the unspecified mortalities observed during the different suckling period is still not completely clear. In fact the young rabbit losses are not uniformly distributed from the day of birth to the weaning time /Coudert 1982/.

With the aim of clarifying this latter point, a commercial rabbitry was controlled for some years and all the data referring to the subject were registered.

MATERIALS AND METHODS

A commercial rabbitry located in Central Italy (standard building with forced ventilation) was monitored for a period of three years and a total of 1830 litters was observed (Tab 1).

Tab. 1 Number of the observed litters per season and per order of parturition.

ORDER OF PARTURITION	SEASONS				
	WINTER Dec-Feb	SPRING Mar-May	SUMMER Jun-Aug	AUTUMN Sep-Nov	TOTAL
FIRST LITTER	69	54	89	95	307
SECOND TO SIXTH	144	140	229	202	715
MORE THAN SIXTH	166	187	221	234	808
T O T A L	379	381	539	531	1830

Standard flat-deck cages and metal nests were used. The latter ones had an access hole and were placed on the floor. The ambient temperature inside the rabbitry ranged from 7½C to 30½C while the day-length was kept constant throughout the three years with a ratio of 16L:8D.

The NZW does were mated 7 - 10 days after delivery and the litters were weaned at 32 days. The primiparous does have been mated when they were 120 days old.

In accordance with the common technology adopted by most Italian rabbit breeders, the day after delivery the litters were balanced by crossfostering and the abnormals and the weight minus-variants were discarded, so that the average size was changed from 8.3 ± 2.77 to 7.9 ± 1.45 (Fig. 1).

The nests were inspected twice a day in proximity of parturition and once a day from delivery to weaning, so that the maximum delay from delivery to the first control was 12 hours.

Since the farm adopted a cyclic management /Facchin 1983/, for operative reasons the data were classified as mortality at

birth and at 6, 15, 21 and 32 days from delivery and they were analyzed not as mortality percentages but as absolute number of dead rabbits, utilizing the model

$$Y_{ijkl} = \mu + \alpha_i + \beta_j + \eta_k + \tau_l + (\alpha*\eta)_{ik} + \epsilon_{ijkl}$$

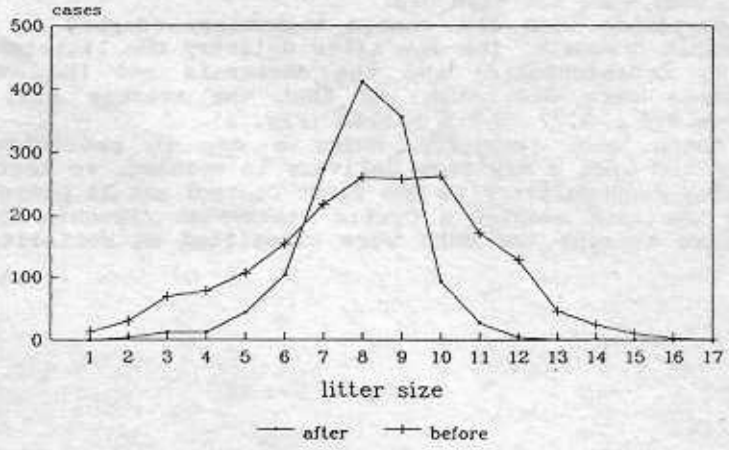
where:
Y = deaths
μ = overall mean
α = season, i = 1 to 4
β = order of parturition, j = 1 (first litter), 2 (second to sixth), 3 (more than sixth)
η = year, k = 1 to 3
τ = litter size at the beginning of each monitored period
and ϵ = residuals.

After the analysis, the estimated means were reconverted as mortality rates.

RESULTS AND DISCUSSION

The estimated mortality rates at less than 12 hours from delivery and the mortality rates at 6, 15, 21 and 32 days are reported in Tab. 2.

FIG. 1
litter size before and after crossfost.



Tab. 2 ANOVA estimated mortality rates

EFFECTS	MORTALITY RATE					
	AT BIRTH	AT 6 DAY	AT 15 DAY	AT 21 DAY	AT 32 DAY	OVERALL
OVERALL MEAN	17.5	13.1	5.9	3.9	2.6	32.3
ORDER OF PARTURITION						
FIRST LITTER	17.8	10.9	7.5^{A}	4.9^{A}	3.8^{A}	36.3^{A}
FROM 2nD TO 6th	17.5	12.2	5.1^{B}	3.3^{B}	2.7^{B}	30.1^{B}
MORE THAN 6th	17.4	14.6	5.4^{B}	3.9^{AB}	2.0^{B}	31.8^{B}
SEASON						
WINTER	25.7^{A}	14.4	7.5^{A}	6.2^{A}	3.7^{A}	38.0^{A}
SPRING	8.1^{B}	12.7	4.4^{B}	3.3^{B}	2.0^{B}	30.7^{B}
SUMMER	15.4^{B}	11.6	5.9^{AB}	2.6^{B}	2.8^{B}	29.1^{B}
AUTUMN	18.3^{B}	11.7	6.9^{A}	3.7^{B}	2.8^{B}	32.1^{B}
REGRESSION COEFFICIENT OF LITTER SIZE	+0.16	+0.37	+0.53*	0.00	0.00	+0.25*

Means bearing different letter on the same column are different for P<0.01. An asterisk indicates the significance (P<0.05) of the regression coefficients.

The birth mortality rate seems to depend only on the season, being uninfluenced by the order of parturition or the litter size. As it might be expected in fact, the birth mortality rate is higher during Winter (25.7%) than in the other seasons (P<0.01). Even if no significant differences can be observed between the mean values belonging to the other seasons, Summer and Autumn birth mortalities are higher than the Spring ones.

This fact can be explained by the presence in those periods of some particularly hot days and by the first cold days.

The birth mortality represents a large part of the total rearing losses with the exception of Spring period, during which at 6 days more deaths can be found than at birth. Spring appears to be the most favourable season for lower birth mortality rate in Middle Italy and the value of about 8% estimated for this period is to be considered the minimum value which can be reached

with the described rearing conditions. This observation stresses the importance of improving nest structure and management.

Winter is the worse season too for the overall losses, but its influence is fading as the young rabbits become older.

The order of parturition is uninfluencial in the first periods of rearing, but after 6 days the primiparous does show larger mortality rates than the other groups. A likely explanation can be that, as the milk requirement of the litters rises, the primiparous cannot be able to get enough production and therefore the competition between young rabbits causes more deaths.

The does with more than six parturition don't seem to be worse than those from two to six. It must be noted that the does still in production after six deliveries represent a group where the worse subjects were culled, while that happens only in a slight extent in the second to sixth litter group.

Concerning the influence of litter size on mortalities, in a recent study /Torres 1986/ it was found a positive correlation between the two variables from birth to the 3th week of life, while other Authors /Szendrõ and Barna 1984/ reported the some trend only in the rearing period and a negative correlation at birth. On the other hand Roustan /Roustan 1980/ reported that at birth litters with 6 newborn or less and with 13 or more are equally disadvantaged.

The results of the present research seem to be in accordance with this latter point, even if it must be considered that Roustan reported data belonging to breeders which adopted the crossfostering in a unequal extent. In fact the regression coefficient shows values statistically not different from zero at birth and at the first suckling period.

The litter size displays its influence in the second suckling week, where the mortality rate increases as the young rabbit number rises ($P<0.05$). This effect disappears completely in the third and forth week of life. It can be argued that the milk requirement of litters rises with a high rate after the first week and a fast selection happens, so that after the second week the number of suckling rabbits well fits the doe milking ability.

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SUMMARY

The mortality rates observed in the nest at birth and at 6, 15, 21, and 32 days from delivery and not related to pathological causes were collected for a period of three years in a rabbitry of Central Italy for a total of 1830 litters. The observed data were analyzed according to a linear model taking into account the season, the year and the parturition order as fixed effect and the litter size as covariate. The season appears to be the most important factor in influencing the mortalies. In particular during Winter the birth mortality rate rises in large extent, so that about a quarter of born rabbits is lost. The primiparous does give less survival chance to their litters, but only after 6 days from delivery. The litter size is influent in increasing the mortality only in the middle of the suckling period, but it must be noted that the rabbitry management included the crossfostering technique.

Key words: Rabbit, Nest, Mortality Rate, Environment.

EFFETTO DELLA STAGIONE E DELL'ORDINE DI PARTO SULLA MORTALITA' ALLA NASCITA E NEL NIDO.

Le mortinalità alla nascita e a 6, 15, 21 e 32 giorni dal parto e non riferibili a specifiche cause patologiche, sono state rilevate per tre anni consecutivi in un allevamento del Centro Italia per un totale di 1830 nidiate. I dati raccolti furono analizzati tramite un modello lineare che teneva conto della stagione, dell'anno e dell'ordine di parto quali effetti fissi e delle dimensioni della nidiata quale covariata. La stagione si manifesta come il più importante fattore nell'influenzare le mortalità. In particolare durante l'inverno la mortalità alla nascita cresce notevolmente, tanto che circa un quarto dei coniglietti viene perduto. Alle fattrici primipare si può attribuire una maggiore mortalità ma solo dopo sei giorni dal parto. Le dimensioni della nidiata sono positivamente correlate con la mortalità solo verso la metà del periodo di allattamento, ma occorre notare che nell'allevamento controllato era prevista la tecnica del pareggiamento delle nidiate tramite adozione.
Parole Chiave: Coniglio, Nido, Mortalità, Ambiente.

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