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DOE AND KIT PERFORMANCE IN A SMALL RABBIT POPULATION FROM SUBTROPICAL TRINIDAD[1]

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ABSTRACT : This paper summarizes performance data collected from 226 does producing 1017 litters during 1985-93. Local, high-grade New Zealand White rabbits were housed in wire cages and fed mainly broiler finisher pellets (18% CP) and grass, free choice. The average kit weights at 3, 4 (weaning) and 12 weeks were 224 g, 311 g and 1.61 kg, respectively. The averages for daily gain between 3-4 and 4-12 weeks were 12 and 23 g, respectively. On average, a total of 5.4 kits were born per litter , of which 5.2 were alive; 4.3 survived until weaning at 4 weeks and only 3.9 were alive at 12 weeks . The year of kindling accounted for significant variability in all performance traits studied except in kit weight at 4 weeks and daily gain between 3-4 weeks. The season of birth effect was significant for kit weight at 3 weeks only and kits born during March through May weighed the heaviest. The average values for perinatal, preweaning and postnatal mortality were 3.7, 17.3 and 9.3%, respectively. On average, 26.7% of the breeding does died due to natural or accidental death. 39.5% of the breeding does produced three litters or less and were culled mainly due to poor prolificacy and fertility. Only 12.5% of the does produced 10 litters or more. Fully, 49.7% of the breeding does were culled from the herd before reaching 18 months of age.

RESUME : Performance des lapines et de leurs lapereaux au sein d'une population cunicole réduite élevés en milieu subtropical à Trinidad (Antilles)

Ce papier présente les performances, récoltées entre 1985-et 1993, de 226 lapines ayant produit 1017 portées. Les lapins de la population locale sélectionnée de génotype Néo-Zélandais Blanc, ont été logés dans des cages métalliques et ont été nourris principalement avec un granulé "poulet-finition" (18 % protéines) et de l'herbe en libre accès. Le poids moyen des lapereaux à 3, à 4 semaines (sevrage) et à 12 semaines était de 224 g, 311 g et 1,61 kg, respectivement. Les gains de poids moyens journaliers entre 3-4 et 4-12 semaines étaient de 12 et 23 g respectivement. Le nombre moyen de lapereaux à la naissance était de 5,4 dont 5,2 nés vivants; en moyenne, 4,3 ont atteints le sevrage à 4 semaines et seuls 3,9 étaient vivants à 12 semaines. Toutes les caractéristiques de performance étudiées ont été significativement affectées par l'année de naissance, exceptée pour le poids à 4 semaines et le gain journalier entre 3 et 4 semaines. L'effet de la saison à la naissance sur le poids des lapereaux était significatif à trois semaines seulement et les lapereaux nés entre Mars et Mai étaient les plus lourds. Les taux moyens de mortinatalité et mortalité pour les périodes pré-sevrage et post-sevrage ont été de 3,7 ,17,3 et 9,3 % respectivement. En moyenne, 26,7 % des lapines reproductrices sont mortes naturellement ou accidentellement; 39,5 % d'entre elles ont donné 3 portées ou moins et ont été éliminées principalement pour cause de mauvaise prolificité ou défaut de fertilité. Seules 12,5 % des femelles ont produits 10 portées ou plus. En moyenne 49,7 % des lapines reproductrices ont été éliminées du cheptel avant d'avoir atteint l'âge de 18 mois.

INTRODUCTION

Most developing countries of the tropics and the subtropics have an abundant supply of forages but import most of their animal concentrate feeds, which are becoming more expensive by the month. These same countries import significant amounts of meat and meat products. Several authors have discussed the potential of rabbits for meat production in the above context (OWEN *et al.*, 1977 ; CHEEKE, 1979 ; RASTOGI, 1983 ; EHIOBU et al., 1997). In fact, rabbits can be considered as one of the several *emerging species* quite suitable for meat production. RASTOGI (1987) suggested that small farmers and periurban dwellers could usefully and profitably integrate small scale rabbit production into their routine farming or gardening activities, combining limited amounts of concentrate feed with crop residues, forages, agro-byproducts and kitchen scraps etc.

In the West Indies, several Caribbean Basin countries are actively encouraging small-scale rabbit production, utilizing mainly local forages. It is then necessary to generate scientific information on performance of rabbits and production systems under local environmental and husbandry conditions. Accordingly, our Faculty of Agriculture and Natural Sciences established a small rabbitry at the University Field Station in March, 1983. The herd was closed by the end of 1983 with ten does and four bucks in stock. However, due to inbreeding depression in performance (RASTOGI and HEYER, 1992), outside bucks were introduced every two-to-three years. Currently, the rabbitry houses 44 breeding does, six bucks and their followers.

This Paper summarizes the available performance data on kit growth and doe performance.

MATERIALS AND METHODS

The data was collected from 226 does producing 1017 litters during a nine-year period from 1985 to 1993. Earlier data was excluded from this study. The rabbitry was initially stocked with locally adapted rabbits of mixed breeding, including contributions from several breeds, for example, New Zealand White, Californian, Checkered Giant and Flemish Giant etc. In

[1]Expanded version of a paper presented at the 6th World Rabbit Congress in Toulouse, France (9-12 July, 1996)

Table 1 : Least-squares constants and standard errors for kit growth traits

Classification	No.	Average kit weight at 3 wks (g)	Average kit weight at 4 wks (g)	Average kit weight at 12 wks (kg)	Average daily gain 3-4 wks (g)	Average daily gain 4-12 wks (g)
General Mean	945	224± 2	311 ± 6	1.61± 0.01	12 ± 0.7	23 ± 0.3
Year of birth		**	NS	**	NS	**
1985	45	13 ± 9	-4 ± 26	-0.20 ± 0.07	-2 ± 3	-3 ± 1.2
1986	91	-26± 7	-33 ± 1 9	0.09 ± 0.05	-1 ± 2	-1 ± 0.9
1987	124	-29± 6	-38 ± 1 6	-0.06 ± 0.04	-1 ± 2	0 ± 0.7
1988	97	-7± 6	-5 ± 1 8	-0.02 ± 0.05	0 ± 2	0 ± 0.8
1989	97	32± 7	43 ± 18	0.17 ± 0.05	1 ± 2	2 ± 0.8
1990	92	11±7	15 ±18	-0.02 ± 0.05	0 ± 2	0 ± 0.9
1991	100	10± 6	21 ±17	0.14 ± 0.05	1 ± 2	2 ± 0.8
1992	132	7 ± 6	5 ± 15	0.07 ± 0.04	0 ± 2	1 ± 0.7
1993	167	-11 ± 6	-4 ± 15	0.02 ± 0.04	1 ± 2	0 ± 0.7
Season of birth		**	NS	NS	NS	NS
Dec. - Feb.	240	-3 ± 4	-5±11	0.02 ± 0.03	0 ± 1	0 ± 0.5
Mar. - May	278	14 ± 4	21 ± 11	-0.01 ± 0.03	1 ± 1	0 ± 0.5
June - Aug.	237	-10 ± 4	-13 ± 11	-0.06 ± 0.03	0 ± 1	-1 ± 0.5
Sep. - Nov.	190	-1 ± 4	-3 ± 12	0.06 ± 0.03	0 ± 1	1 ± 0.6
Year x Season		NS	NS	**	NS	**

**P< 0.0 1; NS, not significant (P>0.05)

choosing replacements, preference was given to all-white rabbits such that the present stock is high-grade New Zealand White. The does and bucks were selected from larger-than-average litters. In addition, bucks were selected for postweaning growth. In order to keep the generation interval short, bucks were replaced by their sons as early as possible. However, significant decline in doe and kit performance and high doe mortality was observed during early 1985, which was attributed principally to inbreeding depression. The herd was reopened during August 1985, and four bucks were brought in from the sister isle of Tobago. Two more bucks were introduced from outside sources in June 1987, and one in October 1988. In all, 45 bucks were used during the period of this study. Since late 1985, a group rotation-breeding scheme was in effect in order to keep the level of inbreeding low.

The rabbitry was located in an old dairy barn with open sides providing adequate ventilation. The minimum and maximum daily temperatures ranged between 22 to 33^{0}C, with relative humidity remaining mostly above 80%. The rabbits were housed in individual wire cages. These were initially imported from France with a French Government grant. New cages were built locally. Automatic waterers and feeders were in use. Does were rebred 17 days post kindling and kits were weaned at 28 days of age and each litter was fattened as a group. Due to the unavailability of commercially compounded rabbit feed on the local market, a combination of "Broiler Finisher" pellets (18% crude protein), "Milk Booster" pellets (16% CP) and recently "Rabbit Feed" (17% CP) has been used at various times. Wilted grass from the farm was provided free choice. The management of the rabbitry was of reasonably good standard with proper sanitation procedures being observed. Health status of rabbits was also generally good with low level of parasitism and no incidences of mites or sore hocks were seen during the period of this study.

The data was analyzed by least-squares method for unequal subclass numbers (HARVEY, 1960). A fixed model including year, season of birth and the interaction was considered.

RESULTS AND DISCUSSION

Kit performance

Least-squares constants and tests of statistical significance of various effects are presented in Table 1 for kit growth traits. The year of birth contributed significantly to the total variation in kit growth except for 4-weeks kit weight and 3-4-weeks average daily gain. The season of birth had significant effect only on average kit weight at 3 weeks. Year-by-season interaction was significant for 12-weeks kit weight and 4-12-weeks average daily gain. The models used accounted for less that 10% of the total variation in any of the measures of kit growth. Thus, the causes of significant variability in these traits could not be identified.

The average kit weights at 3, 4 (weaning) and 12 weeks were 224 g, 311 g and 1.61 kg, respectively. The averages for daily gain between 3-4 and 4-12-weeks were 12 and 23 g, respectively. Considering the small mature size (~3 kg) of the breeding stock, stressful humid-tropical climate and substandard feeding system employed, these results for growth were found to be generally satisfactory and compared favorably with results obtained elsewhere under relatively similar environment (MGHENI, 1978 ; OWEN, 1978; OMOLE, 1982; RASTOGI, 1991). However, compared with the results obtained in temperate countries using nutritionally balanced pelleted diets (HARRIS *et al.*,

Table 2 : Least-squares constants and standard errors for litter size

Classification	No	Litter size at birth			Litter size at		
		Total	Dead	Alive	3 wks	4 wks	12 wks
General Mean	1017	5.4 ± 0.1	0.2 ± 0.0	5.2 ± 0.1	4.4 ± 0.1	4.3 ± 0.1	3.9 ± 0.1
Year of kindling		**	**	**	**	NS	**
1985	47	0.0 ± 0.2	0.1 ± 0.1	-0.1 ± 0.3	-0.6 ± 0.3	-0.6 ± 0.3	-0.2 ± 0.3
1986	100	-0.5 ± 0.2	0.1 ± 0.0	-0.6 ± 0.2	-0.6 ± 0.2	-0.7 ± 0.2	-0.4 ± 0.2
1987	134	0.1 ± 0.1	0.1 ± 0.0	0.0 ± 0.1	0.0 ± 0.2	0.0 ± 0.2	*0.3* ± 0.2
1988	104	-0.1 ± 0.2	0.1 ± 0.0	-0.2 ± 0.2	0.0 ± 0.2	0.0 ± 0.2	0.4 ± 0.2
1989	100	0.1 ± 0.2	0.0 ± 0.0	0.1 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	0.6 ± 0.2
1990	100	0.2 ± 0.2	-0.1 ± 0.0	0.3 ± 0.2	0.4 ± 0.2	0.5 ± 0.2	0.2 ± 0.2
1991	104	0.3 ± 0.2	-0.2 ± 0.0	0.5 ± 0.2	0.6 ± 0.2	0.6 ± 0.2	-0.1 ± 0.2
1992	142	0.1 ± 0.1	-0.1 ± 0.0	0.2 ± 0.1	0.1 ± 0.2	0.1 ± 0.2	-0.1 ± 0.2
1993	186	-0.3 ± 0.1	-0.1 ± 0.0	-0.2 ± 0.1	-0.5 ± 0.1	*-0.5* ± 0.1	-0.7 ± 0.1
Kindling season		NS	NS	NS	NS	NS	NS
Dec. - Feb.	257	0.0 ± 0.1	0.0 ± 0.0	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.1 ± 0.1
Mar. - May	298	-0.1 ± 0.1	0.0 ± 0.0	-0.1 ± 0.1	-0.1 ± 0.1	0.0 ± 0.1	0.0 ± 0.1
June - Aug.	259	0.1 ± 0.1	0.0 ± 0.0	0.1 ± 0.1	0.1 ± 0.1	0.1 ± 0.1	0.0 ± 0.1
Sep. - Nov.	203	0.0 ± 0.1	0.0 ± 0.0	0.0 ± 0.1	0.0 ± 0.1	-0.1 ± 0.1	-0.1 ± 0.1
Year x Season		NS	NS	NS	NS	NS	*

*P< 0.05; **P<0.0 1; NS, not significant (P>0.05)

1983 ; GOMEZ DE VARELA *et al,* 1983), growth performance as well as concentrate pellet consumption of our rabbits was slightly over a half. As an aside, it should be noted that the growth rate of rabbits fell rapidly after 12-13 weeks of age thus necessitating slaughter at an average of 1.6 kg live weight.

Doe performance

Least-squares constants and tests of significance for litter size at various stages are presented in Table 2. The year of kindling accounted for significant variability in litter size from birth to 12 weeks. The effects of season of birth and the interaction were not significant.

The year effects were confounded with any changes in the genetic constitution of the rabbit population as a result of selection as well as inbreeding. There was a time-related increase in the number of live kits at birth and litter size at later stages until 1992 when, presumably, inbreeding started to reverse this trend. These results were superior to the preliminary ones based on data until 1986 from the same rabbitry (RASTOGI, 1991).

Doe performance figures in this study were comparable or superior to those reviewed by OWEN (1978) and reported by EHIOBU *et al.* (1997) but, were inferior to those reported by OMOLE (1982) in Nigeria, LUKEFAHR (1985) in Cameroon and SHQUEIR (1986) in the West Bank *via* Israel. Some of these differences in performance were connected with breeds, climate and feed. Other differences were particular to our herd and these are examined in a little more detail below.

The major difference was due to the level of inbreeding effective in our herd owing to its small size. The average level of inbreeding of *all* does kindling in 1986 was estimated at 5% and at 10% when *only inbred* does were considered (RASTOGI and HEYER, 1992). This inbreeding was the main cause of decline in

Table 3 : Frequency distribution for causes of doe disposal

Causes	%
Low fertility	7.0
Poor prolificacy	32.1
Poor mothering ability	7.8
Difficult breeder	11.1
Old age (>24 months)	15.3
Natural and accidental death	26.7

Table 4 : Frequency distribution for number of kindlings completed during a doe's life time

No. of kindlings	%
1 – 2	18.0
3	21.5
4	14.0
5	12.0
6	8.5
7 – 9	13.0
10+	12.5

Table 5 : Frequency distribution for doe's age at culling[a]

Age (month)	%
8 – 14	24.1
>14 – 18	25.6
>18 – 22	16.1
>22	34.2

[a] Mean doe age at culling was 20.1 mo.

the performance of does that kindled in 1986 (Table 2).

From mean litter size values in Table 2, it was possible to compute kit mortality. Figures for perinatal, birth to weaning at four weeks and postweaning (4 to 12 weeks) mortality were 3.7, 17.3 and 9.3%, respectively. This meant that 25.0 % of all kits born alive died before reaching the market/slaughter age. Our mortality figures were relatively higher than those reported by OMOLE (1982) and SHQUEIR (1986) but, lower than that reported by EHIOBU et al. (1997) for preweaning mortality. Moreover, breeding doe mortality was also relatively high as 26.7% died natural or accidental death (Table 3). 39.5% of the breeding does completed only three or less kindlings (Table 4) and were culled mainly due to poor prolificacy and low fertility. Only 12.5% of the breeding does survived long enough to produce 10 or more litters (Table 3). 49.7% of the does were culled before reaching 18 months of age (Table 5); this meant their reproductive life was about 11 months considering that does entered the breeding herd at an average age of 7 months.

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