EFFECTS OF SEASON, GENERATION, NUMBER OF MATING, PARITY AND DOE NUMBER OF TEAT ON DOE AND LITTER BIRTH CHARACTERISTICS IN DOMESTIC RABBIT

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ABSTRACT

Records of 866 kits born in 203 litters over a period of 132 weeks were used to evaluate the effects of season of birth (raining, dry) on litter birth characteristics. Other factors investigated included the effects of generation of birth (1, 2), number of mating (1, 2), parity (1, 2, 3, 4) and doe number of teats (8, 9, 10). Other traits investigated included gestation gain (GG), kindling loss (KL), litter size at birth (LSB), neonatal mortality (NEOM), live birth percentage (LB), mortality per litter (ML), litter weight (LWT) and mean kit weight (MKW). Gestation gain was taken as the difference between doe weight at mating and the weight taken one day pre-partum. Kindling loss was taken as the difference in doe weight one day prepartum and its weight immediately after kindling. Litter weights divided by number of individuals for each litter gave the mean kit birth weight, while the gestation length was obtained as the difference between the dates of successful mating and kindling. Out of the 866 kits produced in two generations, 371 were born in the rainy season (April to September) and 495 in the dry season (October to March). Season of birth did not significantly ($P>0.05$) influence litter size at birth, live birth percentage and mean kit birth weight, although the percent survival was slightly higher during the dry season. The percentage survival at birth for the first four parities were 4.07±1.63, 4.04±1.29, 3.96±1.10 and 3.56±1.46, respectively; corresponding values for gestation length were 31.6±2.7, 31.6±1.8, 31.9±1.6 and 32.2±1.7, respectively. Litter size at birth and mean kit birth weight for single mating were 3.95±1.36 and 38.95±7.87, respectively. Corresponding values for double mating were 3.82±1.45 and 39.14±10.22, respectively. Litter size at birth and mean kit birth weight for does with 8, 9 and 10 teats were 4.12 and 41.73 g, 4.11 and 42.31 g and 4.48 and 41.01 g, respectively. Second generation kits were born in lower litter size and litter weight, they had lower mean kit weight and live birth per litter. Parity, number of mating and doe number of teats had no significant effect ($P>0.05$) on the investigated bio-economic traits. The present results showed that selection of replacement does may not be done with accuracy using external characteristics like doe number of teats. It may be possible to undertake an all year round breeding in commercial rabbitry under tropical condition. The rainy season however remained the best season that favours farmer productivity, especially under forage based backyard rabbitry.

Key words: Season, Generation, Parity, Mating, Birth characteristics.

INTRODUCTION

Rabbit in the feral state exhibit seasonal variation in reproductive capacity (Stephen, 1952). Although improved feeding and housing management have helped to break this season circuit in the commercial rabbits, its performance still follow some seasonal trend in cooler climates. For instance, a study conducted by Mattioli (1982) on 10,940 Californian rabbits showed that the conception in May was 66.1%; it however dropped to 36.7% in September. Casady *et al.* (1971) submitted that the conception rate at the United States of America rabbit experimental station varied from 85% in March and April to as low as 50% or less in September and October. An investigation in Russia by Miroshnichenko and Pomytko (1975) on New Zealand breeds of rabbit showed kindling rate of 100, 80 and 70.95% for the first three parities, respectively. The corresponding values for the first three parities in the Soviet

Chinchilla were 87, 60 and 70, respectively. In another trial, Afifi *et al.* (1987) submitted that average birth weight increased with advance of parity from the first to the fifth and then decreased. Maternal effect is important when analyzing reproductive traits especially the maternal effect of body weight (Araba, 1994), litter size (Odubote and Akinokun, 1990) and gestation length (Ozimba and Lukefahr, 1991). These effects according to Kuhlers *et al.* (1977) may be genetic or environmental in a dam or granddame but are considered environmental in the progeny or grand progeny. Effect of parity on conception rate and litter birth weight have been reported (Odubote and Akinokun. 1990) in this part of the tropics, however much information is still needed on the effect of these factors on rabbit production, such information must necessarily precede large-scale ration-based rabbitry in the country. The objectives of the present study are to determine the effects of season of breeding, generation and parity on some doe productivity traits.

MATERIALS AND METHODS

Does were taking to bucks in a total of 351 mating over a period of 132 weeks. Pregnancies were determined using the combination of gestation-grunt, apparent weight increment and abdominal palpation; straws for nest building were supplied in the kindling apartment or box in the fifth week of pregnancy. Of the 866 kits produced in two generations, 371 were born in the rainy season (April to September) and 495 in the dry season (October to March). The traits evaluated were conception rate (CR), doe weight at mating, doe number of teat (NT), gestation gain (GG), and kindling loss (KL), litter size at birth (LSB), litter size alive at birth (LSAB), % neonatal mortality (%NEOM), litter birth weight (LBW), mean kit birth weight (KBW) and gestation length (GL).

Gestation gain was taken as the difference between doe weight at mating and the weight taken one day pre-partum kindling loss was taken as the difference in doe's weight one day prepartum and its weight immediately after kindling. Litter size (total and alive) were by direct counting of kits, does weights were obtained on top loading scale (10 kg capacity) and litter weight was determined by weighting litter-mates alive at birth on triple beam balance (OHAUS, 2610 g capacity). Litter weights divided by number of individuals for each litter gave the mean kit birth weight, while the gestation length was obtained as the difference between the dates of successful mating and kindling. The mean value for seasons, generations and parities were tested for significant difference (α=0.05) using the mean comparison k-test. A significant difference between two means was assumed where the calculated k-value was greater than 196 (ktab, is 1.96 at $\alpha_{0.05}$), otherwise the difference was assumed to be due to chance.

RESULTS AND DISCUSSION

Season effect was determined on 866 kits born in 203 litters over two generation (Table 1). Dry season mating resulted in higher conception rate (78.5%) than rainy season (70.3%). The seasons of birth did not significantly influence (P>0.05) litter size at birth, percent survival at birth, mean kit birth weight and the gestation length

Table 1: Effects of season on litter birth characteristics

		No of litter	No of kits	LSB	KBW	GL
Rainy	G1	45	202	4.40±1.68	47.27±0.98	32.62±3.88
Season	G2	48	173	3.60±1.35	40.52±10.38	31.84±1.66
Dry season	G1	33	169	5.12±1.33	49.59±8.03	32.03±1.09
	G2	77	322	4.18±15.37	37.68±7.88	31.68±2.04
Population	G1	78	371	4.76±1.58	48.43±9.38	32.27±2.57
	G2	125	495	3.96±1.39	38.73±9.00	31.75±1.89

*For LSB computation only
Effect of season was not significant (P>0.05)

The percent survival at birth for the first four parities were 4.07±1.63, 4.04±1.29, 3.96±1.10 and 3.56±1.46, respectively (Table 2), corresponding value for gestation length were 31.6±2.7, 31.6±1.8, 31.9±1.6 and 32.2±1.7, respectively. The differences were not significant (P>0.05).

Table 2: Parity effect on litter birth characteristics

	Parity			
	1	2	3	4
Gestation Length	31.6±2.7	31.6±1.8	31.9±1.6	32.2±1.7
Litter size at birth	4.07±1.63	4.04±1.29	3.96±1.10	3.56±1.46
Litter birth weight	142±61	156±50	140±49	-

Litter size at birth and mean kit birth weight for single mating were 3.95±1.36 and 38.95±7.87, respectively. Corresponding values for double mating were 3.82±1.45 and 39.14±10.22, respectively (Table 3).

Table 3: Effects of mating system and doe's number of teats on litter characteristics

		Litter size at birth	Kit birth weight
Number of mating	1	3.95±1.36	38.95±7.87
	2	3.82±1.45	39.14±10.22
Number of teats	8	4.12±1.52	41.73±9.69
	9	4.11±1.91	42.31±11.17
	10	4.48±1.13	41.01±8.03

The differences were not significant (P>0.05). Litter size at birth and mean kit birth weight for does with 8, 9 and 10 numbers of teats were 4.12 and 41.73 g, 4.11 and 42.31 g and 4.48 and 41.01 g, respectively. Doe numbers of teat did not significantly (P>0.05) influence the investigated traits. The mean doe weight, litter size at birth (total and alive), litter birth weight, gestation gain and kindling loss were lower in the offspring generation compared with their parents. The offspring generation had significantly (P<0.05) lower gestation gain and kindling loss. The offspring generation had higher neonatal-mortality, although the gestation lengths for the two-generation were comparable (Table 4).

Table 4: Effects of generation of doe on litter birth characteristics

	Doe Weight	GG	KL	LSB	LSAB	LBW	KBW	GL	NEOM%	NT
G1	1951^{a}	288^{b}	199^{b}	4.8^{a}	4.7^{a}	221^{a}	48^{a}	32.3^{a}	1.62	8.2^{a}
G2	1745^{a}	196^{a}	158^{a}	4.0^{a}	3.7^{a}	141^{a}	39^{a}	32.1^{a}	7.62	8.8^{a}

GG, KL, LSB, LSAB, LBW, KBW, GL, NEOM(%) and NT represent gestation gain, kindling loss, litter size at birth, litter size alive at birth, litter birth weight, kit birth weight, gestation length, percent neonatal mortality and doe number of teats respectively, while G1 and G2 represent generations 1 and 2, respectively. Mean for the same trait carrying the same superscript are not significantly different (P<0.05)

The conception rate in the present work is comparable with 73% reported by Zerrouki *et al.* (2004) for the local Kabylian rabbits in Algeria. The litter size at birth and litter size alive at birth were comparably poorer in the present study. This may in part be due to the maternal effect of doe bodyweight as the mean bodyweight of doe in the present study was comparably lower than that of the Kabylian does. It was however comparable with the litter size at birth of 4.8 from 111 litter records obtained by Orunmuyi *et al.* (2006) in their study on a non-descript rabbit population in Nigeria. This suggests that most of the present stock in the country have undergone some decline over the years and there may be the need to totally replace them with new imports or improve them through selection and crossbreeding.

The present work agrees with the submission of Bakare (1984) that conception rate was higher in the dry season for rabbits bred in the South-West of Nigeria. The present result agreed with the submission of Tizhe *et al.* (2006) and Zerrouki *et al.* (2004) that season had no significant effect on most other productive traits. They however observed that it had significant effect on litter weight, partial milk yield and parturition interval. It may therefore be possible to undertake an all year round breeding in commercial rabbitry, although dry season breeding may also require housing construction and management practices that keep temperature low in the breeding quarters, as does are apt to reject kits under heat stress. The rainy season also remained the best season that favours farmer productivity,

especially under forage based backyard rabbitry, where availability of forages and grains are major considerations. The lower litter weight for primiparous does compared with second parity does in the present work may find basis in the maternal effect of age and size on reproduction. According to Gianola and Tyler (1974) parity effect could result as combination of increased nutrition supply to the embryo, increased placenta size and physical effect. Odubote and Akinokun (1990) reported that parity significantly affect litter birth weight. Earlier, Afifi *et al.* (1987) observed that average birth weight increased with advanced parity up to the fifth parity. The effect of parity is however not invariable, for instance, Singh *et al.* (2004) reported that parity did not significantly improve litter birth and weaning characteristics in German Angora rabbit. Das and Yadav (2007), on the other hand, reported that parity significantly influenced litter size at birth and service per conception.

The present work also agreed with the submission of Das and Yadav (2007) that the number of mating did not influenced most productive traits. They however observed that, it significantly influenced the individual litter weights and therefore concluded that double mating will benefit farmers more than single mating. The poorer trend beyond second parity in the present work may be partly due to the fact that the means were obtained from second generation does, which were younger in age at time of breeding compared with the parent group. Zerrouki *et al.* (2004) observed that total litter size and mean kit birth weight were lower in young first parity does compared with older multiparous does. Wanis (1958) observed that the offspring of young Baladi rabbit does tends to have a slightly lower weight and smaller litter size than old dams.

Ovulation potential, the first factor affecting prolificacy, increases on the average with the doe size (Lebas *et al.*, 1986). This together with age may account for the lower performance of second generation does in litter size at birth, litter weight and kit birth weight. It therefore becomes imperative to establish optimal breeding age and weight for rabbit under tropical production environment as such would enhance productivity in commercial units.

CONCLUSIONS

The present results showed that selection of replacement does may not be done with accuracy using external characteristics like doe number of teats. It may be possible to undertake an all year round breeding in commercial rabbitry, under tropical condition. The rainy season however remained the best season that favours farmer productivity, especially under forage based backyard rabbitry, where availability of forages and grains are major considerations**.**

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