Middle-East Journal of Scientific Research 14 (4): 559-565, 2013
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2013.14.4.71142

Seasonal Effects on Mating, Kindling and Weaning on Litter Parameters of Rabbit

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Abstract: Seasonal effects of mating, kindling and weaning were assessed on some reproductive parameters of rabbits in Bauchi, Nigeria. Significant (P<0.01) season of mating effect was observed on parturition interval (PI), indicating early dry (ED) season having the longest (52.38±2.16 days) interval followed by late dry (LD) season (44.20±7.34 days) while late rainy (LR) season had shortest (42.00±0.85days). Season of kindling also had significant (P<0.05) variation on partial milk yield of day fourteen (PMY-14D) and litter weight of day twenty eight (LW-28D). Late rainy season had highest values on PMY-14D (63.69±0.92g) and LW-28D (612.30±26.70g) followed by early rainy (ER) season (62.91±1.31g and 552.50±40.70g for PMY-14D and LW-28D respectively) while early dry season had the least (47.88±4.84g and 200.3±28.90g respectively for PMY-14D and LW-28D). Significant season of weaning effect was observed on number of kits weaned (NW) and PMY-28D. Late rainy season had the highest (2.94±0.15) number of kids weaned followed by ER (2.55±0.22) while LD season had the least (1.38±0.25). The corresponding PMY-28D was 50.15±0.77g, 50.52±0.91g and 31.81±4.05g respectively. Generally, LR season is likely to favor mating, kindling and weaning parameters of rabbits followed by ER season.

Key words: season · Mating · Kindling · Weaning · Rabbits

INTRODUCTION

Though rabbit can breed all the year round, but their reproductive performance varies with season [1]. Ferraz *et al*. [2] reported highest productivity of rabbits in mild and dry season. Sittmann *et al*. [3] reported that total litter size at birth and number born alive per litter exhibited a seasonal trend. Yahaya [4] reported significantly lower body weights of kits at 2, 4, 6 and 8 weeks old when kindled between February and May (Hot-dry season) and higher weights when kindled between June and September (cool-wet seasons). Iyeghe-Erakpotober *et al*. [1] reported a significant (P<0.05) seasonal effect on litter size at weaning. Does kindled in the cool-dry season weaned significantly fewer kits than those that kindled in hot-dry and cool-wet seasons. These may be attributed to higher feed intake as a result of lower daily temperatures which was in turn translated into tissue in the growing rabbits. Kits kindled in the hot-dry season grew faster than those kindled in the cool-wet and cool-dry season [4]. Iyeghe-Erakpotober *et al*. [1] however reported better performance of kits kindled in the late-wet season (July-September) than those kindled in early wet (April-June) and late dry (January-March) seasons. They also attributed this to higher feed intake occasioned by cool environmental conditions resulting from constant rain fall and lower ambient temperatures. Khalil *et al*. [5] similarly observed that there was a general tendency for litter size and weight and mean weight of young to be lower when kindling took place in the early months of the year of production and to increase as the month of the year of kindling advances and decreases again with kindling at the end of the year of production. This trend was also observed by El-khiishin, *et al*., [6]. Significant

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effect of season on individual weaning weight was reported by Cassidy, *et al*., [7]. Abdul Malik *et al*. [8] however reported that there was no seasonal influence on litter size at birth and at weaning. It is the intention of this work to highlight the seasonal variability effects on some reproductive parameters of rabbits in Bauchi Nigeria, so as to tackle some seasonal problems associated with rabbit's production in the study area and the country.

MATERIALS AND METHODS

Chinchilla, Dutch Belted and New Zealand White breeds of rabbit were used for the study in the ratio of 5:1 (female to male) of each breed making a total of eighteen forming the breeding foundation stock. Animals were obtained from teaching and research farm of Federal Polytechnic Mubi in Adamawa State. Females and males of these breeds were of ages of five and seven months respectively. Before the animals' arrival for the research, all necessary equipment were put in place which include drinkers, feeders, electric fittings especially light, feeds and cages. Animals were kept for 14 days preliminary periods during which they were subjected to the same conditions of feeding and husbandry management for acclimatization. The female rabbits were then randomly allocated to fifteen individual cages made up of Iron sheet measuring about 90cm x 50cm x 60cm x and 75cm above the ground level to ease the cleaning and feeding. All animals were identified cage wise to enhance proper record keeping. Males of each breed were kept in individual mating pens of $1.5m^2$, large enough to allow mating and convenience of cleaning. The floor and roof of the cages were covered with wire mesh of $1cm^2$ to ease ventilation, cleanliness and to avoid feed contamination as the feaces would drop freely from the cage.

Animal Management: Plastic feeders and drinkers of the same size and color were provided in the cages. Kindling nest made up of wooden materials, dried grass, straw and wood shavings were also provided in each cage from the 20^{th} -25^{th} day of gestation. Routine management operations of regular cleaning, disinfection of pens, cages, feeders, drinkers and treatment of sick animals were carried out on regular bases throughout the study period. Animals were fed on forages, such tridax, legumes hay, kitchen waste, amaranths waste and cereal offal. Broiler finisher at the rate of 120g per animal per day was provided as supplementary feed while clean water was provided *ad libitum*.

Mating: Stud mating was adopted, where females were carried to males' pen. Mating period was 6-7 am and 6-7 pm when temperature was generally low and to enhance mating during these times. Seven days rebreeding interval was adopted for the study. Fourteen (14) days post mating palpation for pregnancy test was carried out in accordance with the procedure described by Fielding [9]. Does must be relaxed and sitting naturally where fingers were gently run along the abdomen between the back legs, small bead-like lumps would be felt if the doe was pregnant. If not pregnant, such an animal was rebred immediately.

Data Collection and Analysis: Date of mating, kindling, weaning, gestation length, litter, birth weight, litter performance at 7, 14, 21 and 28 days were recorded. Litter mortality at 7, 14, 21 and 28 days, still birth, doe initial weight and weight at 7, 14, 21 and 28 days post mating and weight of does after parturition were also taken. Milk yield determination as described by Lukefahr, *et al*., [10], that is, the weigh-suckle-weigh method at 7, 14, 21 and 28days was carried out. Number of kits weaned per individual female per breed was also recorded.

Data collected were cross checked for duplications, improbable dates and omissions. They were then keyed into computer, printed and cross checked again. The data sets were analyzed using the general linear model (GLM) of Minitab statistical analysis system [11]. Breed, parity, year, season were considered the major factors while the covariates were age at parturition (AP), doe initial weight (DIW), gestation length (GL), parturition interval (PI) and number of kits kindled alive at birth (NKA). Four seasons were adopted.

Early rain (ER)-April to June
Late rain (LR) July to September
Early dry (ED) October to December
Late dry (LD) January to March
Correlation coefficients were calculated between some measurable parameters.

RESULTS AND DISCUSSION

Effect of Season of Mating: A significant ($P<0.001$) season of mating effect was observed only on parturition interval (PI) with the early dry season showing the longest (52.38±2.16 days) PI while late rainy season had the shortest (42.00±0.85 days). Non significant season of mating effect was observed on most parameters (Table1).

Table 1: Means and SE by Season and Month of Mating of Some Rabbit parameters

		GL	NKA	LBW	ABWL	NW	PI
Season-M	N	NS	NS	NS	NS	NS	***
LD	24	30.42±0.10	3.71±0.28	297.30±23.50	80.87±2.28	2.50±0.21	44.20±7.34
ER	33	30.49±0.09	4.39±0.18	366.50±15.30	84.31±2.20	3.06±0.15	43.31±2.30
LR	32	30.66±0.09	4.38±0.21	415.30±17.80	95.66±2.22	2.03±0.20	42.00±0.85
ED	21	30.57±0.11	5.29±0.21	444.00±14.90	85.48±1.89	0.95±0.16	52.38±2.16
Month –M		NS	**	**	***	***	***
1	6	30.67±0.21	3.17±0.60	281.70±49.40	90.67±3.57	2.67±0.42	56.70±11.60
2	7	30.14±0.14	3.71±0.29	274.30±20.10	74.52±3.38	2.57±0.43	-
3	11	30.46±0.16	4.00±0.49	320.50±43.00	79.56±3.20	2.36±0.31	3.8.00±0.41
4	12	30.58±0.15	4.00±0.33	332.90±30.20	84.10±3.86	2.92±0.34	42.00±1.48
5	10	30.60±0.16	4.40±0.27	358.00±17.70	82.87±4.54	3.20±0.25	49.20±6.94
6	11	30.27±0.14	4.82±0.30	410.90±24.10	85.86±3.36	3.09±16	39.27±1.09
7	11	30.64±0.15	4.27±0.38	399.10±38.80	93.70±3.85	2.27±0.36	40.36±1.59
8	13	30.69±0.13	4.08±0.33	398.10±23.40	98.02±3.74	2.46±0.27	43.77±1.33
9	8	30.63±0.18	5.00±0.38	457.50±27.60	94.52±4.16	1.00±0.19	41.37±1.24
10	6	30.67±0.21	4.83±0.40	421.70±31.80	87.82±2.96	0.50±0.34	51.00±2.74
11	12	30.50±0.15	5.42±0.26	457.90±20.50	85.27±2.82	1.25±0.18	57.25±2.11
12	3	30.67±0.23	5.67±0.67	433.30±16.70	81.67±4.41	0.67±0.33	35.67±0.67

NOTE: N= Number of Observation, NS= Not Significant, ** = P<0.01, ***= P<0.001, GL= Gestation Length, NKA= Number of Kits Kindled alive, LBW= Litter Birth Weight (g), ABWL= Average Birth Weight of Litter (g), NW = Number of Kits Weaned, PI= Parturition Interval, LD= Late Dry, ER= Early Rain,
LR= Late Rain, ED=Early Dry, Season-M=Season of Mating, Month-M=Month of Mating.

However when the coarser division of the year (season) was changed to a finer division (months), most parameters were observed to be significantly (P<0.001) affected by month of mating except GL, number of kits kindled alive (NKA) and litter birth weight (LBW) which were significant at (P<0.001). The month of December had largest number of kits kindled alive (5.67±0.67) while month of September and November (457.5±27.6g and 457.9±20.5g) recorded the highest litter birth weight. The month of January and February had the least value of NKA (3.17±0.60) and LBW (274.30±20.10g) respectively. Month of August had highest (98.02±3.74g) average birth weight of litter (ABWL) while February had the least (74.52±3.38g). Months of May and June had highest (3.20±0.25 and 3.09±0.16 respectively) number of kits weaned (NW) while the month of October (0.50±0.34) and December (0.67±0.33) had the least. Longest (57.25±2.11 days) PI was recorded in the month of November while the month of December had the shortest (35.67±0.67 days).

The non significant season of mating effect on gestation length (GL), NKA, LWB, ABWL and NW contradicts the report of Torries and M Pla [12]. The intensive management system of production in the rabbitry could have masked the effect of season on pregnant rabbits in this study. This study however agrees with the findings of [4] who did not observe any significant effect of season of mating on GL, litter size, LWB and ABWL. The significant seasonal effect on PI however agrees with what was obtained by El-khiishin, *et al*., [6]. The significant effect of month on most parameters could be due to the fact that month is a finer division of season contained in a year. This could likely emphasize differences that have been covered up in the coarser division of seasons.

Generally the significant effect of month on NKA, LWB, ABWL, NW and PI could be attributed to changes in nutrition, climatic and disease conditions as stated by [13-16]. The non significant effect of month of mating on GL agrees with the findings of Abdulmalik, *et al*. and Yahaya [4, 8] who also reported non-significant effect of month of mating on GL which they said was due to steady management throughout the months of production.

Effect of Season of Kindling: Significant (P<0.05) season of kindling effect was observed on partial milk yield day fourteen (PMY-14D) and litter weight day twenty eight (LW-28D). Late rainy season had highest (63.69±0.92g) PMY-14D and LW-28D (612.30±26.70g while early dry season had the least PMY-14D (47.88±4.84g) as well as LW-28D (200.30±28.90g) (Table 2). The month of kindling had significant (P<0.001) effect on most parameters except GL and PMY-28D. The month of December was observed to have the largest (5.42±0.26) NKA while February had the least (3.17±0.60). December (457.90±20.5g) and October (457.50±27.60g) had similar highest LBW while

Table 2: Means and SE by Season of Kindling of Some Rabbit Parameters

		GL	NKA	LBW	ABWL		NW		PI
Season – K	N	NS	NS	NS	NS	N	NS	N	***
LD	16	30.44±0.13	3.88±0.35	306.90±25.10	81.91±2.76		2.25±0.31		270.00±22.10
ER	33	30.55±0.09	4.12±0.21	336.40±18.50	82.21±2.19		2.82±0.18		366.80±24.00
LR	35	30.54±0.09	4.47±0.20	402.40±16.30	92.84±2.23		2.30±0.17		416.30±16.20
ED	26	30.58±0.10	5.15±0.19	449.40±14.40	88.71±2.04		1.00±0.14		246.70±26.40
		LW – 14D	LW -21D	LW – 28D	ALW -7D		ALW – 14D		ALW – 21D
SEASON-K		NS	NS	*	NS		NS		NS
LD	16	265.00±34.50	301.70±39.50	334.40±41.90	101.67±3.34	15	115.78±5.87	15	131.74±7.63
ER	33	416.70±30.20	478.4±36.40	552.50±40.70	108.05±4.04	33	140.08±5.52	33	163.7±7.12
LR	35	474.7±19.70	536.90±24.50	612.30±26.70	132.97±3.93	35	179.77±5.85	35	215.95±7.44
ED	26	196.70±29.10	190.00±30.10	200.30±28.90	119.34±3.48	21	150.56±6.27	20	171.95±7.74

Table 2: CONT.

		ALW – 28D		PMY – 7D	PMY – 14D	PMY – 21D	PMY – 28D
Season – K	N	NS	N	NS	*	NS	NS
LD	15	147.23±8.12	16	42.88±1.21	53.12±4.00	55.63±4.25	40.81±3.01
ER	33	191.04±7.69	33	50.15±1.22	62.91±1.31	67.91±1.06	50.46±0.88
LR	35	247.95±8.22	35	52.71±0.71	63.69±0.92	67.89±1.04	35.19±3.97
ED	20	189.90±8.78	26	44.23±2.89	47.88±4.84	44.04±4.93	35.19±3.97

NOTE: Season – K = Season of Kindling, N= Number of Observations, NS = Not Significant, * = P< 0.05, GL = Gestation Length (days)

NKA= Number of Kits kindled alive, LBW= Litter Birth Weights (g), ABWL= Average Birth Weight of Litter (g), LW -7D – 28D= Litter Weight at 7D – 28D

ALW – 7D -28= Average Litter weight 7D -28D (g), PMY – 7D -28D=Partial Milk Yield at 7D – 28D (g)

March had the least (274.30±20.10g). Average birth weight of litter (ABWL) was observed highest in September (98.02±3.74g) while least in March (74.52±3.38g). Month of June and July recorded similar highest NW (3.20±0.25 and 3.09±0.16 respectively) while November and January had similar least NW (0.50±0.34 and 0.67±0.33 respectively). Litter weight at day seven (LW-7D), LW-14D, LW-21D and LW-28D (460.00±19.40g, 513.00±17.20g, 593.60±18.30g and 682.70±17.30g respectively) were all found to be highest in July while their corresponding least values were observed in the month of November (161.7±72.20g), January (101.70±57.00g), January (105.70±53.00g) and November (96.70±68.50g). Average litter weights at day seven (ALW-7D), ALW-14D, ALW-21D and ALW-28D were observed highest in August as follows; 138.09±6.92g, 190.02±9.49g, 236.80±12.60g and 267.30±15.60g while the respective least values were in March (94.52±3.72g and 115.60±10.50g) and January (117.30±34.70g and 132.00±7.96g. Partial milk yield at day seven (PMY-7D) and PMY-21D were highest in July (54.36±1.36) and June (72.50±1.34) and the corresponding least values were in November (32.50±10.50g and 18.30±11.70g respectively (Table 2).

Most parameter in this study was significantly affected by month of kindling which seems to emphasize the hidden effects of the seasons. Afifi, *et al*., [13] in support also reported significant effect of month of kindling in rabbit which he attributed it to be due to the fact that during the early month of the year, green pasture was not available in sufficient quantity and the little was of low nutritive value. However when the month of kindling advanced to rainy season, there was lush pasture of high nutritive value and when the end of year approached, there was lack of green pasture as the weather became warm and less favorable.

Season of Weaning: Significant season of weaning effect was evident on the number of kits weaned (P<0.05) and PMY-28D (P<0.001). Number of kits weaned was highest (2.94±0.15) in the late rainy season and lowest in late dry season (1.38±0.25). Partial milk yield at 28 days was highest (50.52±0.91g) during early rainy season and lowest (31.81±4.05g) during the late dry season.

Significant P<0.05) month of weaning effect was pronounced on number of kits weaned and ALW-28D. Number of kits weaned was highest (3.18±0.18) in August and lowest (0.57±0.10) in December. Average litter weight at 28D had highest value (270.00±17.00) in September and lowest (148.33±4.41g) in February (Table 5).

Number of kits weaned was found to be significantly affected by season and month of weaning; PMY-28D however was affected by season only. On the other hand, ALW-28D was affected by month and not by season of

Table 3: Means and SE by Month of Kindling of Some Rabbit Parameters

Month–K	N	GL NS	NKA ***	LBW ***	ABWL ***	NW ***	LW – 7D ***
1	3	30.67±00.67	3.67±0.67	433.30±16.70	8167±4.41	0.67±0.33	221.70±63.90
2	6	30.67±0.21	3.17±0.60	281.70±49.40	90.67±3.57	2.67±0.32	221.70±39.10
3	7	30.14±0.14	3.71±0.29	274.30±20.10	74.52±3.38	2.57±0.43	283.60±30.30
4	12	30.50±0.15	4.08±0.45	318.70±39.30	77.93±3.35	2.50±0.31	326.70±47.70
5	11	30.55±0.16	3.90±0.34	335.90±33.00	86.29±3.47	2.82±0.35	383.60±42.90
6	10	30.60±0.16	4.40±0.27	358.00±17.70	82.87±3.54	3.20±0.25	396.50±28.20
7	11	30.27±0.14	4.82±0.30	410.90±24.10	85.86±3.35	3.09±0.16	460.00±19.40
8	11	30.36±0.15	4.27±0.38	399.10±38.90	93.70±3.85	2.27±0.36	405.50±38.30
9	13	30.69±0.13	4.08±0.33	398.10±23.40	98.02±3.74	2.46±0.27	388.50±21.19
10	8	30.63±0.18	5.00±0.38	457.50±27.60	94.52±4.16	1.00±0.19	325.00±43.10
11	6	30.67±0.21	4.83±0.40	421.70±31.80	87.82±2.96	0.50±0.34	161.70±72.22
12	12	30.50±0.15	5.42±0.26	457.90±20.50	85.27±2.82	1.25±0.18	237.10±27.40

Table 3: CONT.

Month–K	N	LW – 14D ***	LW – 21D ***	LW – 28D ***	ALW – 7D ***	No.	ALW – 14D ***	N	ALW – 21D ***
1	3	101.70±57.00	105.70±53.00	116.00±58.10	110.00±12.60	2	112.50±32.50	2	117.30±34.70
2	6	308.30±43.80	356.70±44.10	401.70±48.30	105.83±3.96	6	117.08±3.90	6	137.50±7.93
3	7	297.90±52.00	338.60±60.80	370.30±60.10	94.52±3.72	7	115.60±10.50	7	131.00±13.20
4	12	332.20±51.20	386.70±6070	446.10±64.20	100.04±5.93	12	129.20±10.60	12	149.80±14.50
5	11	450.50±58.00	495.30±71.20	559.10±78.00	116.88±7.15	11	147.33±8.31	11	172.20±11.10
6	10	481.00±34.30	570.00±42.80	673.00±53.10	107.93±7.71	10	145.08±9.16	10	171.08±9.74
7	11	513.20±17.20	593.60±18.30	682.70±17.30	123.11±5.13	11	166.47±8.50	11	195.53±7.72
8	11	458.20±47.70	502.70±60.70	560.90±64.30	138.09±6.92	11	190.02±9.49	11	236.80±12.60
9	13	453.50±31.60	517.70±37.60	596.20±41.10	136.97±7.43	13	182.40±11.20	13	215.60±14.40
10	8	248.10±58.80	187.60±41.40	211.00±46.50	126.87±5.06	7	162.14±5.10	7	183.71±8.06
11	6	131.70±79.20	126.70±98.20	96.70±68.50	121.87±8.00	3	152.22±7.78	2	180.00±20.00
12	12	195.00±30.60	223.20±35.30	245.00±38.10	113.47±5.20	11	142.70±11.00	11	163.00±12.50

Table 3: CONT.

Month – K	N	ALW – 28D ***	N	PMY – 7D ***	PMY – 14D NS	PMY – 21D ***	PMY – 28D NS
1	2	132.00±7.96	3	43.33±3.33	36.70±18.60	36.70±18.60	26.70±13.30
2	6	155.00±7.96	6	41.67±1.67	50.00±2.58	52.50±2.50	39.67±0.33
3	7	144.90±12.40	7	43.71±2.12	62.86±1.01	66.43±1.80	47.86±1.84
4	12	176.40±16.70	12	46.25±2.39	58.17±1.99	65.67±1.58	51.25±1.58
5	11	194.80±10.10	11	51.82±1.39	62.73±1.95	66.18±1.89	49.09±1.89
6	10	204.40±10.50	10	53.00±1.86	68.80±1.63	72.50±1.34	51.00±1.00
7	11	224.17±6.76	11	54.36±1.36	64.27±1.90	70.27±1.38	51.82±1.22
8	11	267.30±15.60	11	51.82±0.76	62.73±1.41	65.27±1.67	48.64±1.19
9	13	257.70±15.60	13	52.08±1.37	64.00±1.53	68.08±2.00	50.77±1.48
10	7	206.0±11.10	8	50.00±3.41	53.75±8.22	52.50±7.73	40.00±5.98
11	2	187.50±17.50	6	32.50±10.50	31.70±14.20	18.30±11.70	15.00±10.20
12	11	179.50±13.60	12	46.25±1.64	52..08±4.98	51.25±4.93	41.67±4.05

NOTE: Month- K= Month of Kindling, N= Number of Observations, NS = Not Significant, ***= P< 0.001, GL= Gestation Length (days)
NKA= Number of Kits Kindled Alive, LBW= Litter birth weight (g), ABWL=Average Birth Weight of Litter (g),
LW -7D – 28D= Litter weight at 7D – 28D, ALW – 7D -28= Average Litter Weight 7D -28D (g)

Table 4: Means and SE by Season of Weaning of Some Rabbit Parameters

Season– W	N	NW *	LW - 28D NS	N	ALD - 28D NS	N	PMY – 28D ***
LD	21	1.38±0.25	231.40±38.50	16	159.40±12.20	21	31.81±4.05
ER	29	2.55±0.22	456.00±43.60	29	178.66±8.23	29	50.52±0.91
LR	33	2.94±0.15	638.50±27.90	33	222.02±7.82	33	50.15±0.77
ED	27	1.70±0.19	409.90±45.50	25	237.20±10.60	27	44.81±2.70

NOTE: Season – W = Season of Weaning, N = Number of Observations, *= P<0.05, ***=P<0.001, NS= Not Significant, NW: Number of Kits weaned,
LW -28D= Litter Weight at 28D, ALW -28D= Average Litter Weight 28Day (g), PMY – 28D=Partial Milk Yield at 28days (g),
LD= Late Dry, ER= Early Rain, LR= Late Rain, ED= Early Dry

Table 5: Means and SE by Month of Weaning of Some Rabbit Parameters

Month- W	No.	NW *	LW-28D NS	No.	ALW-28D *	No.	PMY-28D NS
1	13	1.231±0.166	239.1±35.6	12	171.60±14.70	13	41.54±3.73
2	4	2.000±0.816	293.0±115.0	3	148.33±4.41	4	30.00±10.00
3	4	2.250±0.629	338.0±88.5	4	149.20±16.70	4	39.50±0.50
4	6	2.833±0.401	413.3±49.6	6	150.40±13.20	6	49.17±1.54
5	13	2.615±0.311	474.8±65.7	13	178.60±15.60	13	50.77±1.48
6	10	2.700±0.367	533.0±81.3	10	193.80±11.10	10	49.50±2.03
7	12	3.167±0.207	680.0±44.1	12	210.07±9.44	12	51.250±0.897
8	11	3.182±0.182	687.3±20.5	11	219.92±7.29	11	51.36±1.19
9	10	2.200±0.389	545.0±68.9	10	270.00±17.00	10	49.00±1.45
10	12	2.333±0.256	582.5±42.1	12	256.90±16.00	12	50.42±1.56
11	8	1.000±0.189	211.0±46.5	7	206.90±11.10	8	40.00±5.98
12	7	0.571±0.297	108.6±59.1	3	185.0±10.40	7	19.29±9.29

NOTE: Month -W =Month of weaning, No =Number of observation, * =P<0.05, NS =Not significant, NW=Number of kits weaned, LW-28D=Litter weight at 28D(g), ALW 28D=Average litter weight at 28D(g), PMY-28D =Partial milk yield at 28D(g)

Table 6: Correlation Coefficient between Some Rabbits Parameter

NKA	AP	PI	GL	WW – 28D	ABWL	PMY – 28D	PMY – 21D	PMY-14D	PMY-7D	ALW-28D	ALW-21D	ALW-14D	
-0.065NS	0.189NS	- 0.156 NS	0.026 NS	0.685***	0.526***	- 0.022 NS	0.018 NS	0.060NS	0.088NS	0.685***	0.703***	0.779***	ALW-7D
0.024 NS	0.080 NS	- 0.193 NS	0.064 NS	0.915***	0.529***	0.045***	0.148 NS	0.146NS	0.252**	0.915**	0.955***		ALW-14D
0.004 NS	0.064 NS	- 0.220**	0.0081 NS	0.973***	0.492***	0.060 NS	0.178	0.131NS	0.263***	0.973***			ALW-21D
- 0.040 NS	0.026 NS	- 0.256**	0.073 NS	1.000***	0.451***	0.060 NS	0.206**	0.130NS	0.265***				ALW-28D
0.267***	- 0.196***	- 0.060 NS	0.058 NS	0.265***	- 0.029 NS	0.557	0.576***	0.652***					PMY-7D
0.136NS	-0.364***	-0.035NS	-0.043NS	0.130NS	-0.075NS	0.850***	0.877***						PMY-14D
0.040NS	-0.471***	-0.113NS	-0.049NS	0.206**	-0.103NS	0.920***							PMY-21D
0.036NS	-0.416***	0.107NS	0.034NS	0.060NS	-0.032NS								PMY-28D
-0.235**	0.279***	-0.066NS	0.141NS	0.451***									ABWL
0.040NS	0.026NS	-0.256**	0.073NS										WW-28D
-0.017NS	0.159NS	0.087NS											GL
0.033NS	0.322***												PI
0.203**													AP

NOTE: NS=Not Significant, **=P<0.01, ***=P<0.001, NKA= Number of Kids Kindled Alive, AP= Age at Parturition(days), PI=Parturition Interval(days), GL=Gestation Length(days), WW-28D=Weaning Weight(g), ABWL=Average Birth Wight of Litter(g), PMY-7-28D=Partial Milk Yield from 7-28days(g), ALW-7-28D=Average Litter Wight from 7-28days(g),

weaning. This finding could be attributed to the sensitivity of the individual parameters to season and month related changes. This report is in agreement with the report of many authors [15, 17] that rabbit responds to changes in season or month or both due to parameters under study.

Relationship Between Some Rabbit Parameters: Correlation values (Table 6) between rabbit tend range from low, through medium to high while many values were positive others were negative, while many are significant (at various levels) others were not. High and positive correlation coefficients were observed between ALW-14D and ALW-7D (0.779), ALW-21D and ALW-7D (0.703), ALW-14D and ALW-21D (0.955), ALW-28D and ALW-7D (0.685), ALW-28D and ALW14D(0.915), ALW-28D and ALW-21D (0.973). Most of the negative correlations between parameters had low absolute values for instance PMY-28D and ALW-7D (-0.022), average birth weight of litter (ABWL) and PMY-7D (-0.029), ABWL and PMY-14D (-0.075), ABWL and PMY-21D (-0.103), ABWL and PMY-28D (-0.032 and gestation length (GL) and PMY-14D (-0.043).

The correlation values indicated the degree of relationship between parameters involved. The values from (0.1-0.3) indicates low relationship for instance between PMY-7D and ALW-14D (0.252), values from (0.4-0.5) indicated medium relationship as observed between ABLW and ALW-21D (0.492) while any value $\geq$0.5 indicated high relationship as obtained between weaning weight (WW) and ALW-7D (0.685), WW and ALW-14D (0.915). The positive and negative values observed between parameters indicated direction of relationships. Positive indicates that the increment of one variable leads to increment of the corresponding variable as obtained between ABWL and ALW-7D (0.526) while a negative value signifies the opposite as observed between number of kits kindled alive (NKA) and ABWL (-0.235).

Where correlation coefficients between traits are high and positive, the value of one trait could be used as an indicator of the value of the other. Where the correlation is high but negative, could mean that the high value for one trait could indicate low value for the other. These are important in assessing traits that are difficult to measure if they are strongly associated to traits that are easy to

measure as observed between WW and ALW-7D (0.685) and WW and ALW-14D (0.915). Generally the positive and moderate to high correlations among litter traits in this study agrees with other authors [18-21].

REFERENCES

1. Iyeghe-Erakpotobor, G.I., 2001. Genetic, Environmental and Nutritional Factors Influencing Growth and Reproduction of Rabbit in the Semi-humid Tropics PhD. Thesis, ABU Zaria.
2. Ferraz, J.B.S., R.K. Johnson and J.P. Eler, 1991. Breed and environmental effects on Reproductive traits on California and New Zealand white rabbits. Journal of Applied Rabbits Research, 14: 172-179.
3. Sittmann, D.B., W.C. Rollins, K. Sittmann and R.B. Cassidy, 1964. Seasonal variation in the reproductive traits of New Zealand white rabbits. Journal of Reproduction Fertility, 8: 29-37.
4. Yahaya, H.K., 1993. Performance of New Zealand white, Calfonia and Chinchilla rabbits and their Crosses in a Warm Tropical Environment. M.Sc. Thesis, Dpartment of Animal Science, ABU Zaria.
5. Khalil, M.H.E., E.A. Afifi and M.E. Emara, 1987. Doe litter performance at weaning for two breeds of rabbits with special emphasis on sire and doe effects. Journal of Applied Rabbit Research, 10: 12-18.
6. El-khiishin, A.F., A.L. Badreldin, M.M. Oloufa and M.A. Kheireldrin, 1951. Growth development and litter size in two breeds of rabbits. Bulletin, Faculty of Agriculture, Cairo University, Egypt.
7. Cassidy, R.B., W.C. Rollins and D. B Settmann, 1962. Effect of season and age of dam on individual weaning weights, number weaned and total litter weight of hutch raised domestic rabbits. Small Livestock, 46: 7.
8. Abdulmalik, M., G.I. Iyeghe-Erakpotobor and D.A. Osinowo, 1992. Comparative study of reproductive performance of three breeds of rabbits in Shika. Paper presented at the 17th Annual conference of the Nigerian society of animal production (NSAP), 22-26, March, 1992. Abuja, Nigeria, pp: 6.
9. Fielding, D., 1991. The Tropical Agriculturalist, C.T.A. Macmillan Education Ltd London and Basingstoke, pp: 50-60.
10. Lukefahr, S.D., W.D. Hohenboken, P.R. Checke and N.M. Patton, 1983. Doe Reproduction and Preweaning litter performance of straight breed and cross breed rabbits. Journal of Animal Science, 57: 1090-1099.
11. Statistical Analysis System Institute, 1987. Users Guide. SAS Institute Inc., Carryvoy.
12. Torries, C. and M. Pla, 1988. Preweaning viability of young rabbits and its relationship with the number of traits of dam. Animal Breeding Abstracts, 35: 4-7.
13. Afifi, E.A., E.S.E. Galal E.A. El-Tawil and S.S. El-Kishin, 1976. Litter weight in three breeds of rabbits and their crosses. Egyptian Journal of Animal Production, 16: 99-108.
14. Afifi, E.A., M.M. Abdella, A.M.M. El-Sarafy and G.A. El-Sayyad, 1982. Litter traits as affected by feeding urea, breed group and other non genetic factors. 7th International congress for statistics, computer science, Social and Demographic Research Cairo.
15. Afifi, E.A. and M.E. Emara, 1985. Pregnancy duration for pure bred and cross bred litters in rabbits. Journal of Applied Rabbit Research, 8(4): 158-160.
16. Khalil, M.H.E., F.B. Owen and E.A. Afifi, 1987. A genetic analysis of litter traits in Bauscat and Giza white rabbits. Journal of animal Production, 45: 123-134.
17. Afifi, E.A., E.S.E. Galal, E.A. El-Tawil and S.S. El-Kishin, 1976. litter size at birth and at weaning in three breeds of rabbits and their crosses. Egyptian Journal of Animal Production, 16: 109-119.
18. Khalil, M.H.E., E.A. Afifi, M.E. Emara and J.B. Owen, 1988. Genetic and phenotype aspects of doe reproduction in 4 breeds of rabbits. Journal of Agricultural Science, 110(1): 191-197.
19. Ngondjon, M. and N. Nwakalor, 1988. Estimate of genetic parameters in a mixed population of purebred and cross bred rabbits 111. Genetic correlations, proceedings of the silver Aniversary Conference of Nigeria Society for Animal Production and Inaugural Conference of the West Africa Society for Animal Production, 21026 March, Abeokuta, Nigeria, pp: 502-503.
20. Nwagu, B.I., G. Iyeghe-Erakpotobor, I.A. Adeyinka, O.O. Oni, H.K. Yahaya and M.E. Abdulmalik, 2000. Phenotypic correlations for doe performance and litter traits of pure bred rabbits in Shika Zaria, proceedings of the 25th Annual Conference of the Nigerian Society of Animal Production (NSAP), 19-23 March, Umudike, Nigeria, pp: 264.
21. Tahir, I., 2001. An Assessment of Productivity of rabbits at Dgwan farms, Vom, Plateau State. PhD Thesis, Abubakar Tafawa Balewa University, Bauchi, Nigeria.