Scholars Journal of Agriculture and Veterinary Sciences **e-ISSN 2348–1854**
Sch J Agric Vet Sci 2015; 2(4A):297-303 **p-ISSN 2348–8883**

(An International Publisher for Academic and Scientific Resources) DOI: 10.36347/sjavs.2015.v02i04.006

Effects of post partum re-mating period on growth and reproductive performances in Cameroon Local rabbit

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Abstract: In order to study the effects of post-partum (pp) re-mating period on the reproductive and growth performance of local rabbit of Cameroon, 28 fryer rabbits weighing 2733.46±400.32g were used. They received the same diet (2761.58 kcal/kg.DM; 17.60%; 12.36%; 0.69% and 0.99% DM respectively of metabolizable energy, crude proteins, crude fibers, calcium and phosphorus) throughout the study. Lactating does were re-mated to a male at 0; 14; 28 or 42 days pp. Each doe was mated to a buck for 5 minutes per day and females that were refractory to male were then re-presented daily for a maximum period of 4 days or until she accepted male. All the females presented to a male at 0; 28 and 42 days pp accepted the mounting whereas 28.57% of does mated to a buck at 14 days pp-period were not receptive. The average refractory period was null for 42 days pp but not significantly different from others. The fertility rate was 100% with the re-mating period of 42 days pp but not significantly different from those obtained at post partum day 0 (85.71%); 28 (85.71%) and 14 (71.42%). The fertile service was maximum at pp days 14 and 42, but not significantly different ($P>0.05$) from those recorded at parturition and at 28 days pp (85.71%). The litter size was comparable among females re-bred at the 42nd day (8.71±0.45) after kidding and those serviced at 28 days pp (8.00±3.35), 14 days pp (7.8±0.45) and 0 day pp (6.17±0.98). All the kids were alive at parturition in females serviced at 14 and 28 days pp and the mortality rate was less than 10% in other treatments. At weaning the survival rate was significantly ($p<0.05$) low when the does were presented to a buck at 28 days pp as compared to other periods. The milk production was significantly ($p<0.05$) low in females re-bred at the kidding when compared to those obtained while re-mating does at the two longest pp periods. The numeric productivity per year was significantly ($p<0.05$) elevated with day 0 pp as compared to others treatments.

Keywords: Cameroon, local rabbit, doe, kids, post partum, reproduction, growth

INTRODUCTION

One of the most determining choices in cuniculture is the re-mating period after kidding. Thus, many researchers have been working on the effects of the optimal post partum re-mating period in rabbits of definite breeds. As result, the percentage of rabbit does coming in heat according to the post partum re-mating period varies greatly among experiments [1], hence among rabbit breeds. In Cameroon are reared many rabbit strains, descendants of introduced breeds and well adapted to local conditions. Certain of their morphological characteristics remind some pure breeds from neighbouring continents. In addition, according to Kennou [2], rabbit tolerate with difficulty high temperatures associated to elevated humidity, both characteristics of tropical countries. Indeed, when it is hot, rabbit reduce its feeding as so to regulate its internal temperature. High temperatures are detrimental to those animals by inhibiting the œstrus and by increasing embryonic mortality. Such factors portend production performances of Cameroon local rabbit different from those recorded elsewhere in other breeds. No study has been done to estimate the effects of the post-partum rebreeding period on reproduction and growth in Cameroon local rabbit.

Material and methods

Study area

The study was conducted at the teaching and research farm of the University of Dschang. The farm is situated at 5°26' north latitude and 10°4' East longitude and 1400m above sea level. The average annual sunshine duration is 2000h and the average temperature is 24°C (18-30°C).

Animals and housing

Twenty eight fryer rabbits averaging 2733.46±400,32g and adult bucks were used. The animals were housed under natural lighting in metallic cages.

Feeding

All breeders were fed ad libitum with the same ration. The feed composition and chemical characteristics are shown in table 1.

Table-1: Composition and chemical characteristics of the rations

Ingredients	Percentage (%)
Wheat bran	48.5
Corn	22.0
Palm kernel cake	15.0
Cottonseed cake	7.0
Soya bean cake	2.0
Fish meal	1.0
CMNV	3.0
Bone powder	1.0
NaCl	0.5
Total	100.0
Chemical characteristics	
Ca (% DM)	0.69
P (% DM)	0.99
CB (% DM)	12.36
PB (% MS)	17.68
EM (kcal/kg DM)	2761,58
E/P	156.20

DM: dry matter
CMNV: concentrate of Nitrogen Mineral and vitamins

ASSAY

Every 28 females were mated and, at farrowing, were divided into four batches comparable in the live weight and litter size viewpoints and characterized as follows:

- batch 1: females were presented to male on the day of parturition;
- batch 2: females were re-mated at 14 days post partum;
- batch 3: females were re-mated 28 days after parturition;
- batch 2: females were re-mated at 42 days post partum.

Females from each lot were presented to each of the three male rabbits; when after 5 minutes the doe had not been receptive to the first male, she was transferred in the cage of a second and possibly a third male. If none of the three bucks was accepted, she was presented the next day. The presentation of the females refusing to be mated was renewed for four consecutive days. Weaning was performed 28 days after farrowing.

DATA COLLECTION

Receptivity

The receptivity of does was evaluated by presenting them to bucks and recording for each re-mating period the number of females accepting the copulation and the first day of acceptance (number of days during which the female was refractory). The refractory females were presented to males until the acceptance if any or until the fourth day otherwise.

The receptivity rate was calculated by the following formula:

$$Receptivity\ rate = \frac{number\ of\ females\ accepting\ male}{Number\ of\ females\ presented} \times 100$$

Fertility

Fertility is the ability of a female to conceive and carry a gestation until birth. In this study, it was expressed as the number of females farrowing over the number of females presented to males multiplied by 100. Thus the number of females that put to birth for each re-mating interval was recorded.

Fertile mating rate

The rate of fertile mating is the percentage of mated females that put to birth at the presumed end of gestation. Thus, the number of females serviced for each rebreeding period and the number of females putting to birth were counted. This percentage (P) was calculated by the formula below:

$$P = \frac{Number\ of\ females\ farrowing}{Number\ of\ females\ serviced} \times 100$$

Litter size, pups viability and productivity

The number of pups born per litter was registered at birth and the number of dead kids was noted at birth and every day a new mortality was recorded until weaning. These data were used to calculate the rate of viability and the estimated annual numerical productivity at weaning.

The rate of viability at each time was defined as the ratio of the number of live kids on the litter size multiplied by 100. The annual numerical productivity per female was defined as the ratio of the number of rabbits weaned per farrowing on the interval (in days) between two parturitions multiplied by 365.

Milk production

The cumulative production of milk at the 21st day of lactation in rabbits was estimated by the following regression equations obtained from the Cameroonian local rabbit [3]: Y = -756.19+2.16X for primiparous and Y = 2.20X-885.06 for multiparous where:

X = Weight of the litter at 21 days post partum and Y = cumulative amount of milk produced

Growth parameters

The breeding female and kids' weight were measured at kidding and every week thereafter until weaning. For each re-mating period, the evolution of weight and daily weight gain at 21 and 28 days post partum were evaluated.

Statistic analysis

Results were expressed in mean ±SD and in percentage. The one-way analysis of variance and Duncan test were used to compare means and Chi-square test to compare percentages.

RESULTS

Receptivity

Percentage of does accepting the buck

All the female rabbits were receptive to a male at farrowing, 28 days or 42 days pp. Post partum day 14 was the period during which females were the most resistant to males (28.57% refusals). However, no differences were significant (p> 0.05).

Female refractory period

On average, females allowed to mate with a male at day 14 pp took more time (0.40 ± 0.55 day) to accept copulation compared to those presented at parturition and at the 28th day of lactation (0.14 ± 0.38 day). On the other hand, at 42 days pp, all receptive females accepted the buck at the first attempt. None of the differences were statistically significant (P> 0.05).

Whatever the re-mating period, all the receptive females accepted the male within the first two days of presentation (Figur-1). The largest proportion of copulation was obtained at the first presentation to the male. Of all these periods, no female was in heat the third and fourth days of presentation. No significant difference (P> 0.05) was however observed.

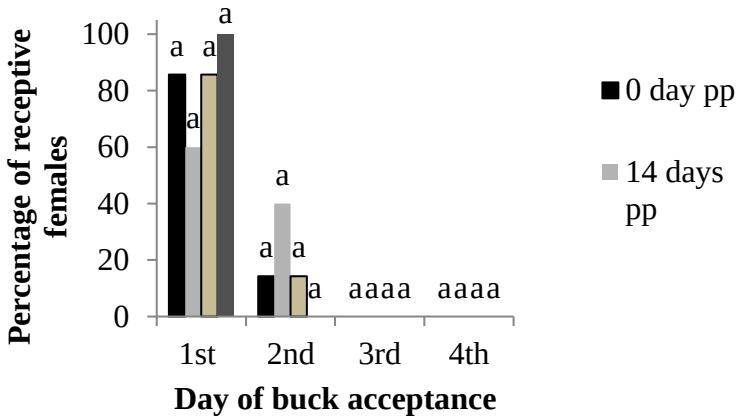

Fig-1: Variation of the percentage of receptive females with the day of presentation and the post partum re-mating period

A: Bars affected by the same letter show no significant difference (p> 0.05); pp: post partum.

Fertility rate

The lowest fertility rate (71.42%) was obtained when rabbit does were presented to male 14 days after kidding. It was 85.71% at parturition and at 28 days later and 100% at 42 days pp. No significant difference (p>0.05) was however observed.

Percentage of fertile mating

Copulations were less fertile (85,71%) when performed at parturition or at 28 days pp as compared to those occurring at 14 and 42 days pp (100%). No difference was however significant (P>0.05).

Litter size, kid viability and numeric productivity

At the parturition, the litter size (table 1) increased linearly with the kidding-post-partum re-mating interval, though not significantly (p>0.05).

The viability rate at parturition was maximum in does mounted at 14 and at 28 days pp, but without any significant difference compared to others re-mating periods.

At weaning, the mortality rate was significantly (P>0.05) elevated in kids born from females rebred 28 days pp with respect to other pp periods.

The annual numeric productivity diminished continuously and significantly ($p<0.05$) with the lengthening of the post partum re-mating period.

Table-2: Variation of some reproductive performances according to the post partum re-mating period

Parameters	*Post partum* day			
	0 (n=6)	**14 (n=5)**	**28 (n=6)**	**42 (n=7)**
Litter size	6.17±0.98[a]	7.8±0.45[a]	8.00±3.35[a]	8.71±1.60[a]
Kids' viability (%)				
-At kidding	91.67±20.41[a]	100.00±0.00[a]	100.00±0.00[a]	94.43±10.83[a]
-At weaning	97.62±5.83[a]	89.29±11.78[ab]	82.95±11.29[b]	95.62±7.66[a]
Annual numeric productivity	64.76±17.86[a]	56.77±9.93[ab]	42.27±20.11[b]	39.28±8.38[b]

a, b: Different letters indicate significant differences among groups ($p<0.05$) in the same line.
(n): number of observations.

Milk production

Cumulated production of milk (Fig-2) increased continuously and significantly ($P<0.05$) with the duration of the post partum re-mating period.

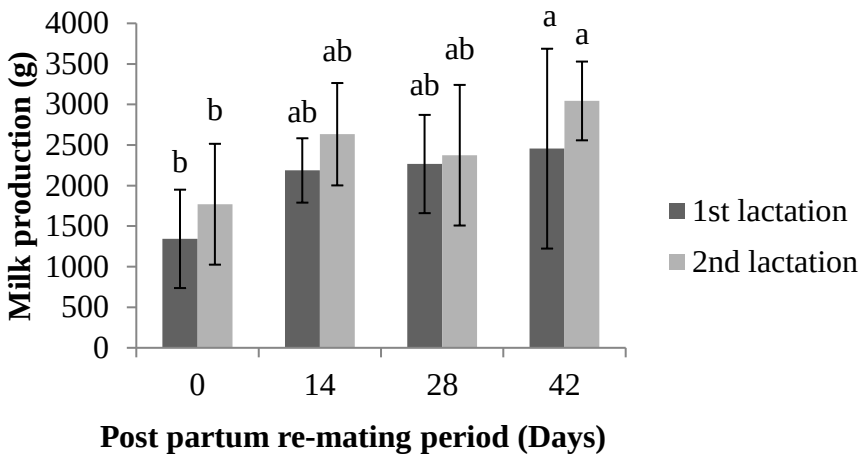

Fig-2: Cumulated production of milk in Cameroonian local rabbit within 21 days according to the post partum re-mating period

a, b: For the same parity, bars affected by the same letter show no significant difference ($p>$ 0.05).

Rabbit growth

Weight evolution

Within 4 weeks of observation, the weight of the does diminished slightly and similarly whatever the pp rebreeding period (figure 3). As for the kids weight, it increased rapidly since the parturition to 4 weeks old in all treatments (Fig-4).

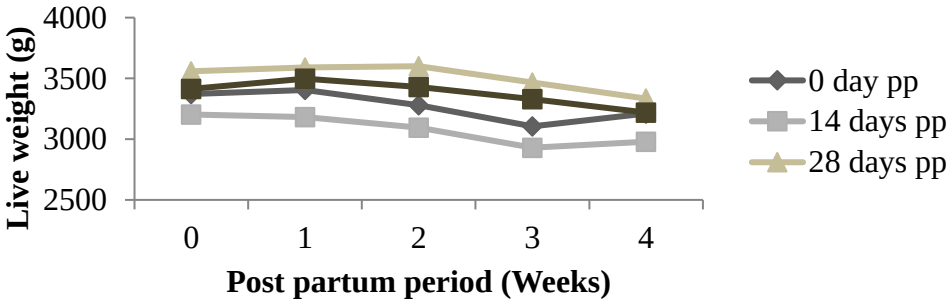

Fig-3: Evolution of live weight in doe according to the post partum re-mating period

pp: post partum

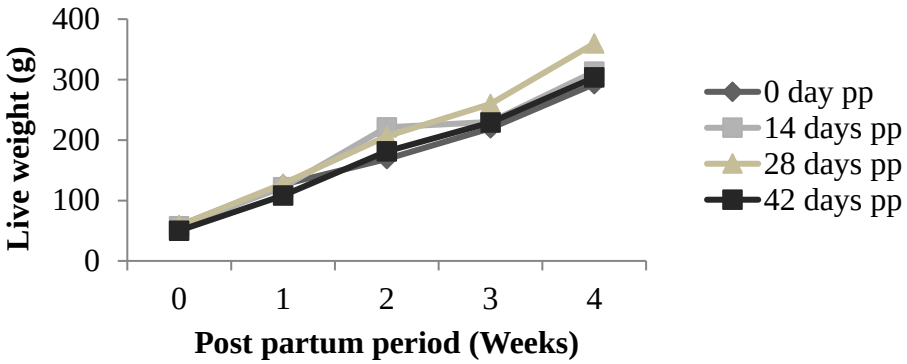

Fig-4: Evolution of kids live weight according to the post partum re-mating period
Pp: post partum

Kid's daily weight gain

The lowest growth rates between parturition and weaning (28 days pp) were observed in rabbits born by females bred immediately after farrowing (Fig-5). The weight gain increased with the interval kidding-re-breeding period until 28 days pp-period. However, no significant differences were observed between treatments (p> 0.05).

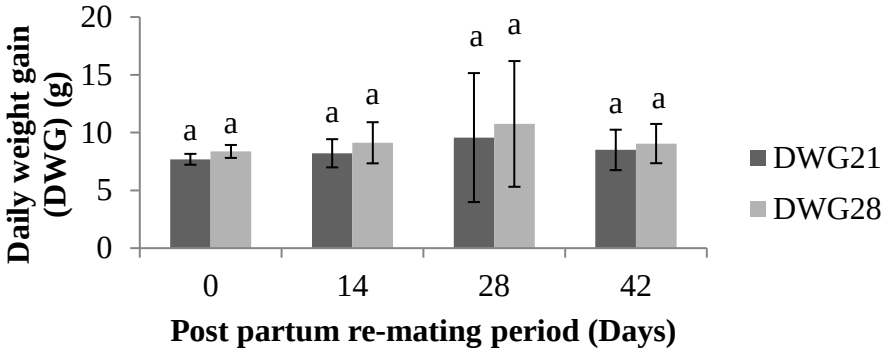

Fig-5: Variation of kids daily weight gain with the post partum re-mating period
a: Bars affected by the same letter show no significant difference (p> 0.05).

DISCUSSION

Receptivity

The evolution of buck acceptance by the local female rabbit of Cameroon with respect to the post partum (pp) re-mating period reinforces the results obtained from the exotic breeds by many authors [4- 8]. This evolution could be explained by that of the blood prolactin concentration and the antagonism between prolactin and the acceptance of male by a doe. Indeed, in rabbit doe, the plasma prolactin concentration is very low during the first two days pp, and then increases continuously until about the 11th day of lactation and starts decreasing [9]. According to Fortun-Lamothe and Bolet [4], the high concentration of prolactin during lactation inhibits partly follicular development, and consequently the steroïdogenesis. In addition, it is known that in rabbit as is other mammals, the acceptance of mounting by a female is an expression of the oestrogens rate in the blood [10, 7].

Fertility and rate of fertile matings

The variation of the fertility rate in relation to pp rebreeding period is in agreement with that reported by Feugier et al. [11] and Theau-Clément and Fortun-Lamothe [6] who showed that, during lactation, rabbit does progressively re-acquire the ability to fertility. The lengthening of the interval between kidding and day of presentation to male in this study is positively correlated with the increase in rate of receptive females.

Differences have been observed between the number of does that accepted copulation and the number putting to birth at the presumed end of gestation. In certain species, the first pp heats are anovulatory; this could explain why in females re-mated directly the day of parturition, the kidding rate is lower than the copulation rate.

Litter size, kids' viability and annual productivity

The litter size in local rabbit of Cameroon did not increase significantly (P>0.05) with the lengthening of the pp period at which copulation occurred. Similar results are documented by Bonano [12]. However, a contradictory tendency was observed with Neozélandais × Californien rabbits. The contradictory results could be due to the functional differences among breeds. The

increase in litter size when pp period elongates is attributable to the increase of ovulation rate and/or the regression of the prenatal mortality [7, 11].

Increase in kids viability in rabbits presented to bucks relatively late after parturition is supported by data obtained with Neozélandais × Californien rabbit does [13] but, contrary to the performances reported using Algerian local population [14]. Reduced viability in kids weaned by does re-mated late after parturition would be a consequence of their high litter size and a poor milk production per kid. Indeed, it is known that milk production by doe constitutes the first condition of pup survival, especially during the first three weeks pp [15].

Milk production

A higher milk production observed in doe presented to the buck late after kidding was already reported by Lammers *et al.* [16] in crossbreed rabbits. The diminution of the milk production when a gestation is close to the day of the last parturition could be due to the low production of lactogen hormones and a weak stimulation of nipples, both associated to the low litter size, and the competition for nutrients between mammary glands and concepti.

Growth

The nutritional status of the doe in this study is expressed by the live weight gain. The absence of significant difference among females from different groups would mean the nutrition of rabbits was not affected by the rebreeding period, and consequently could not be the mediator of any effect we recorded on growth and/or reproduction.

The similarity of growth rate among kids born from females mated at different pp periods, despite a significantly higher milk production recorded in females with the higher litter size, would be due to the comparability of their weight at kidding, and to the high litter size recorded by females with the greater milk production.

CONCLUSION

In Cameroonian local rabbit, day 42 post partum is the period at which rabbit doe accept easily the buck, is more fertile, with greatest litter size. Although a fewer number of does accepted mounting, copulations at day 14 post partum resulted in highest fertility rate. Re-mating at the day of parturition gave rise to the most viable kids at weaning and subsequently the highest numerical productivity

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