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Gestation Length and Litter Size of New Zealand White Grade Rabbit

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ABSTRACT

The purpose of this study was to examine performances and factors that influence the gestation length (GL) and litter size (LS) of New Zealand White Grade (NZW Grade) rabbits. Reproduction records of NZW Grade rabbits were taken from April 2020 to March 2021. Data analysis was carried out using the general linear model (GLM) procedure from Statistical Analysis System (SAS) University Edition V.6p.2. software. Farm showed a significant effect ($P<0.001$) on LS and significant season ($P<0.05$) on GL and LS. GL in the rainy season (31.56) was shorter than the GL in the summer (32.26), but the LS in the rainy season (7.06) was greater than the LS in the rainy season (6.37). Maintenance management should be improved to reduce the impact of the season on GL and LS NZW Grade rabbits.

Keywords: General linear model; gestation lenght; litter size; New Zealand White Grade rabbit; reproduction records.

INTRODUCTION

The New Zealand White Grade Rabbit (NZW Grade) is a broiler-type rabbit developed by most breeders in Central Java. The NZW Grade is the result of a cross between a New Zealand White rabbit imported from the United States in the last ten years with a rabbits that have been adapted to the tropical climate. NZW Grade rabbit have fast growth rates, good carcass quality, and well adapted in tropical environments. According to these permormances NZW Grade have potential for meat producing livestock.

Reproductive performance is important in determining the success of rabbits breeding. The breed of rabbits should have a high fertility and birth rates and good ability to raise their offsprings (Widitania et al., 2016). Reproductive traits that used in assessing the reproductive ability of female rabbits were gestation length, litter size, and mortality of offspring.

Litter size (LS) is a reflection of the fertility of female rabbits and their ability to take care of their offspring (McNitt et al., 2013). The average LS of rabbits in have been reported in Indonesia was range from 7.2 to 8.1 (Brahmantiyo et al., 2017). According to Lebas et al. (1997), LS will increase in the second parity by 10% -20%, then will decrease in the third parity and remain in the fourth parity futher decrease in the fifth parity, and so on. LS was influenced by several factors including the breeds, mating management, the fisiologis condition of the female feed quality during pregnancy period and Low quality of sperm tend to produce fewer offspring (Utami et al., 2019).

Gestation length (GL) of rabbits is influenced by several factors such as breeds (McNitt and Moody, 1991), climate, and weather (Ferraz et al., 1991; Farghaly, 1996). The average GL in rabbits is 32 days, ranging from 27-35 days (Ehiobu et al., 1997). McNitt et al. (1997) reported that longer GL of rabbit in summer was follow with fewer number of LS. This study aimed to examine performance and factors that influence GL and LS of NZW Grade rabbits.

MATERIAL AND METHODS

Data collection

Reproduction records of female NZW Grade rabbits were obtained from 8 farms in Semarang and Kendal Regencies, Central Java Province. Data collection was carried out from April 2020 to March 2021. A total of 182 data were obtained from 74 female rabbits from first to fifth parity. The parameters observed were GL and LS. GL is period from matting to partus, while LS is the number of offsping birth in one parity.

Statistical analysis

Data analysis was performed using Statistical Analysis System (SAS) University Edition V.6p.2. software. General Linear Model (GLM) procedur (SAS Institute Inc., Cary, NC, USA) was used to determine the effect of farm, season, and parity as well as the interaction between them for the GL and LS.

Statistical models was used as follow:

$$y_{ijk} = F_i + S_j + P_k + e_{ijk}$$

where: y_{ijk} is the observed value of a dependent variable (GL/LS), the F_i, the ith effect of farm, S_j, the jth effect of the season, P_k, the kth effect of parity and e_{ijk} is the random residual of y_{ijk}.

RESULTS AND DISCUSSION

The results of significant factors on GL presented in table 1. The season had a significant effect (P<0.001) on GL, while farm and parity had no statistical effect on GL The interaction between these factors did not affect on GL and LS, so there is no discussion about the interaction. The results of the analysis were in agreement with the studies reported by Boyd and Bray (1989); Ferraz et al. (1991) and Farghaly, (1996) who stated that the reproduction of rabbits was influenced by the seasons which has an impact on gestation and lactation of female rabbit. Lebas et al. (1986), reported that season is ones of the external factors that play a role in the physiological and reproductive conditions of female rabbits. Parity has no significant effect on GL but GL will be longer in older female rabbits (Tůma et al., 2010). The Least-squares means analysis of GL in the rainy season is 31.56 whereas, in the summer is 32.26 (Table 3). These results are in accordance with McNitt et al. (1997) reported that GL of rabbit in the summer is longer than which in the winter. Fayeye and Ayorinde, (2010) reported different results of local rabbits in Nigeria, where; GL of rabbits in summer (32.03) was shorter than that in the rainy season (32.62). Overall, the GL of the NZW Grade rabbit in this study was longer than the GL of the New Zealand White Purebreed Rabbit (30.4) by Ghosh et al. (2003) and (31.9) by Fadare and Fatoba (2018).

Table 1. Significance of factors affecting gestation length and litter size

		Gestation length		Litter size	
Factor	db	F Value	Pr > F	F Value	Pr > F
Farm	7	1,02	0,4173	3,94	0,0005
Season	1	3,95	0,0484	6,27	0,0132
Parity	4	0,06	0,9935	of 1.52	0,1974

Description : db = degrees of freedom; Pr = probability

Farm and season were significant (P<0.05) on LS, while parity was no statistically significant on LS in NZW Grade rabbits. This result shows that besides being influenced by genetics, LS is strongly influenced by farm management (Table 2). Farm managements are including breeding, feeding, and housing management. Eiben et al. (2001) reported that female rabbits have been fed a controlled diet showed good reproductive performance, large number of LS and high milk production. Mating management also affected on LS, female rabbits mated during standing heat, with characteristics swollen and red vulva was increased the conception rate and number of LS (Maertens, 1998; Szendrő et al., 2006). Rebollar et al. (2009) reported that female rabbits reared with semi-intensive systems showed better reproductive performance than in the intensive systems.

Table 2. Least squares means for gestation length and litter size on the different farm

Farm	N	GL	LS
1	38	31,89	5,36
2	24	31,85	6,89
3	37	31,31	5.96
4	11	31,85	6.01
5	17	32,63	7,11
6	15	32,19	5,07
7	26	31,29	4.88
8	14	32,34	7,30

Description : N = number of samples; GL = gestation length ; LS = litter size

Table 3. Least squares means for GL and LS on different season and parity

Factor	Category	N	GL	LS
Season	rain	104	31,56	7,06
	dry	78	32,26	6,37
Parity	1	72	31,97	6.69
	2	56	31,95	5,82
	3	31	31,76	6.11
	4	19	32,00	5,83
	5	4	31,87	5,90

Description : N = number of samples; ; GL = gestation length; LS = litter size

The Least-squares means of LS in rainy season was 7.06 while in the summer was 6.37 (Table 3). These results are in accordance with Ayyat et al. (1995) that reported number of LS in summer was fewer number of LS in the winter. Fayeye and Ayorinde, (2010) reported different results where number of LS in the summer (5,12) was larger than number of LS in the rainy season (4,4) for local rabbits in Nigeria. The LS of the NZW Grade rabbits in this study was fewer than the LS of the New Zealand White, Hyla, and Hycole Rabbits (ranged from 7.2 to 8.1) (Brahmantiyo et al., 2017).

CONCLUSION

Reproductive management of rabbits was difficult to formulated. The results of this study can be considered, among others: farm, feeding, and mating managements should be standardized to improve the reproductive performance of female NZW Grade rabbits. Hausing manipulation such as lighting and temperature can could be done as an effort to reduce the effect of season on the reproductive performance of female rabbits.

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