Vitamin E inclusion and feed restriction during pregnancy: effect on post weaning performance of rabbit litters

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ABSTRACT

Limiting the quantity of feed is advantageous because it helps to reduce the cost of feeding and excessive fatness in does and helps in preventing post weaning digestive disorders without affecting the growth performance of the animals. This study evaluated vitamin E inclusion and feed restriction during pregnancy and the subsequent effect on post weaning performance of growing rabbits. One hundred and eighty weaned rabbits were used for this experiment. Three kits whose weaning weights were close to each other were harvested from rabbit does fed with 0 and 15% feed restriction at three periods of gestation with or without vitamin E inclusion and were randomly assigned into 12 treatments of 5 replicates each. Data obtained on feed intake, weight gain and feed conversion ratio of the growing rabbits were subjected to a 2×3×2 factorial arrangement. The interactive effect shows that the 15% levels of feed restriction during pregnancy between 15–19 days of gestation with vitamin E inclusion resulted in improved body weight gain (790 ± 109 g) and best feed conversion ratio (4.14 ± 0.53) of growing rabbits ($P < 0.05$). This result shows that early feed restriction (15–19 days) and levels of feed restriction (15%) during pregnancy did not have any carryover effect during the post weaning periods of the growing rabbits. Late quantitative feed restriction (25–29 days) during pregnancy should be avoided as the carry over effect might show in the litters during the growing periods. Therefore, it can be concluded that quantitative feed restriction at 15% between 15–19 days of gestation with vitamin E inclusion in the diet will not have any negative carryover effect on the litters during the growing periods as the results obtained in this study did not show any negative growth pattern of the litters.

Keywords: Growing rabbits, maternal restriction, vitamin E inclusion, growth

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INTRODUCTION

Feed restriction in growing animals has been studied to improve the biological and economic performance of farm animals. Restricted feeding during the feeding periods reduces the growth rate but growth reduction will be compensated for during the realimentation feeding periods (Szendro *et al*., 1989; Schlolaut and Lange, 1990; Perrier and Ouhayoun, 1996; Tůmová *et al*., 2002; 2003; Dalle Zotte *et al*., 2005). The replacement does fed *ad libitum* diets of high energy levels during the rearing periods often show parturition problems (dystocia) (Fortun-Lamothe and Lebas, 1996). Also, excessive fatness in primiparous does, which has been linked to a high caloric diet and *ad libitum*

feeding, can in turn lead to a reduction in the number of newborn kits, (Fortun-Lamothe and Lebas, 1996). To reduce the excessive fatness of replacement does, restricted feeding is frequently applied in growing rabbits (Dalle Zotte *et al*., 2005). Vitamin E (α-tocopherol) is an important antioxidant that cannot be synthesized by most mammals and humans and therefore is required from the diet. Vitamin E deficiency can impair fertility in all farm animals, this makes vitamin E sometimes being called the fertility vitamin (Bowen, 2003). Research on the effect of maternal restricted feeding on the possible influence on the offspring's growth performance is scarce and limited. Thus, this experiment sought to find out the effect of maternal feed restriction in different gestation periods with or without vitamin E supplementation during pregnancy on subsequent litter performance during the growing periods.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Rabbitary Unit of the Directorate of University Farms, Federal University of Agriculture, Abeokuta (FUNAAB), Ogun State. The site is located in the rain forest vegetation zone of South-Western Nigeria on latitude 7°13'49.46'' N, longitude 3°26'11.98'' E, and altitude 76 m above the sea level. The climate is humid with a mean annual rainfall of 1,037 mm and mean temperature ranges between 34.7–35.2°C while the humidity of 83% was recorded using a Thermo-hygrometer (Google Map, 2015). The hutches were placed inside a stable house with half-built of concrete blocks. The remaining upper part was covered with wire mesh for ventilation and the top was covered with asbestos roofing sheets. Daylight of 12 h and dark periods of 12 h was observed during the experiment.

Experimental Animals and Management

A total of one hundred and eighty (180) weaned rabbits were used for this experiment. The rabbits were weaned at 6 weeks of age, and they were crosses of chinchilla and New Zealand white rabbits. Fifteen (15) kits were selected from each restriction period (15–19, 20–24, and 25–29 days of gestation) for each level of feed restriction (0 and 15%) from rabbit does fed with (300 mg/kg) or without vitamin E inclusion at the time of weaning. The initial live weights of these kits ranged between 536.66 ± 63.99 and 796.66 ± 100.82 g. The kits were divided into 12 groups of 5 replicates of 3 rabbits each for each level (0 and 15%) and periods of restriction with or without vitamin E inclusion. Each replicate was housed in a hutch of dimension 0.8×0.5×0.6 m. Mash form of feed was served to the rabbits as a daily ration. Feeders and drinkers were provided in each of the hutches for *ad libitum* feeding and watering. The composition of concentrate diets for the rabbit does during pregnancy and concentrate fattening diet for post-weaned rabbits are provided in Table 1.

Data Collection

The experiment lasted for 8 weeks, during which data were collected on feed intake and weight gain. Feed intake (g) was the amount of feed consumed by the rabbit in a cell. It was measured by measuring the quantity of feed given to each rabbit per day after which the left over was measured the following morning to get the amount of feed consumed. Weight gain (g) was defined as the difference in the live weight of rabbit in each hutch at successive intervals of 7 days in a period of 8 weeks. It was measured early in the morning (7 a.m.) weekly before the feed was given to the rabbits. The feed conversion ratio of the weaned rabbit (FCR) was expressed as feed intake divided by weight gain.

Statistical Analysis

The data were homogenous and follow normal distribution before it was further subjected to statistical analysis. The experimental layout was in a 2×3×2 factorial arrangement and data collected were subjected to three-way analysis of variance using SAS (1999). Significantly ($P < 0.05$) different means were separated using Duncan's multiple range test of SAS (1999) statistical package.

Table 1 Composition of concentrate diet for rabbit does during pregnancy and post-weaned rabbits

Parameters	Diet A	Diet B	Diet C
Ingredients			
Maize (%)	48.00	47.50	47.50
Fish meal (%)	2.00	2.00	2.00
Soybean meal (%)	3.00	3.00	3.00
Wheat offal (%)	10.00	23.00	23.00
Groundnut cake (%)	14.00	12.00	12.00
Rice husk (%)	20.00	7.00	7.00
Bone meal (%)	1.50	3.00	3.00
Oyster shell (%)	1.00	2.00	2.00
Salt (%)	0.25	0.25	0.25
Vitamin and mineral premix* (%)	0.25	0.25	0.25
Vitamin E (300 mg/kg)		–Vit	+Vit
Proximate analysis			
Metabolizable energy (kcal/kg)	2,591.80	2,578.80	2,578.80
Ash (%)	7.74	2.74	2.74
Crude fibre (%)	15.50	10.65	10.65
Crude protein (%)	15.80	16.20	16.20
Nitrogen free extract (%)	40.50	42.50	42.50

Note: Diet A = concentrate fattening diet fed to post-weaned rabbits
Diet B = concentrate diet fed to the rabbit does without vitamin E inclusion
Diet C = concentrate diet fed to the rabbit does with vitamin E inclusion
* Premix contained vitamin A 8,000 IU, vitamin D3 2,000 IU, vitamin E 4,000 IU, vitamin K 2 mg, riboflavin 4.20 mg, vitamin B12 0.01 mg, pantothenic acid 5 mg, nicotinic acid 20 mg, folic acid 5 mg, choline 300 g, Mn 56 mg, Fe 20 mg, Cu 10 mg and Zn 50 mg

Ethical Approval

All procedures guiding animal welfare were strictly adhered to following the rules and regulations of the Animal Welfare Committee of College of Animal Science and Livestock Production, Federal University of Agriculture, Abeokuta.

RESULTS AND DISCUSSION

The effects of feed restriction levels, periods of feed restriction, and vitamin E inclusion during pregnancy on subsequent litter performance of rabbit does are shown in Table 2. The final weight and weight gain of growing rabbits were not affected by the levels of feed restriction of rabbit does restricted during pregnancy ($P > 0.05$). The result obtained in this study is in agreement with the work of Adeyemo (2014) who reported heavier final weight and weight gain for growing rabbits from *ad libitum* fed does than restricted fed groups during pregnancy.

Weight gain of growing rabbits was influenced by the periods of feed restriction ($P < 0.05$). Growing rabbits from does restricted at 15–19 (727 ± 109 g) and 20–24 (727 ± 142 g) days of gestation recorded statistically similar mean value for weight gain which significantly

differed from growing rabbits of does restricted at 25–29 days of gestation (P < 0.05) that had the lowest mean value (707 ± 114 g). The results obtained in this study could not be attributed to the treatment effect. Total feed intake of growing rabbits was influenced by the periods of feed restriction (P < 0.05). Growing rabbits from does restricted at 25–29 days of gestation had statistically highest mean value (3,251 ± 154 g) for total feed intake which significantly differed from growing rabbits of does restricted at 15–19 (3,213 ± 97 g) and 20–24 (3,230 ± 156 g) days of gestation (P < 0.05). The result obtained in this study shows that as the length of the period before the restriction commences increases, the total feed intake also increases.

Although vitamin E inclusion during pregnancy did not significantly affect weight gain of growing rabbits (P > 0.05), the weight gain of growing rabbits from does fed with vitamin E inclusion (747 ± 126 g) was numerically higher than growing rabbits from does fed without vitamin E inclusion (694 ± 113 g). The result obtained in this study is in contrast with the work of Castellini *et al*. (1998) who reported heavier weight gain in control rabbits than in the vitamin E supplemented group. The average feed intake of growing rabbits from rabbit does fed without vitamin E inclusion was significantly higher than the rabbit does fed with vitamin E inclusion (P < 0.05). The result obtained on average feed intake is in agreement with the work of Castellini *et al*. (1998) who reported lower feed intake (g/day) in the vitamin E supplemented group than in the control group. For feed conversion ratio, though it was not significant (P > 0.05), growing rabbits from rabbit does fed with vitamin E inclusion during pregnancy had a better feed conversion ratio compared to growing rabbits from rabbit does fed without vitamin E inclusion. These results show that growing rabbits whose does were fed with vitamin E utilized the feed better than the growing rabbits whose does were not fed with vitamin E during pregnancy.

Table 3 shows the interactive effect between levels and periods of feed restriction during pregnancy on subsequent litter performance. The highest final weight (1,485 ± 211 g) and weight gain (778 ± 145 g) of growing rabbit were observed from rabbit does on 0% feed restriction at 20–24 days of gestation while the least weight was obtained from rabbit does on 0% feed restriction at 15–19 days of gestation for final weight (1,253 ± 100 g) and with 15% feed restriction at 20–24 days of gestation for weight gain (676 ± 122 g). The results obtained in this study on final weight and weight gain of growing rabbits from does fed *ad libitum* during pregnancy could be as a result of *ad libitum* feeding of their does during pregnancy that resulted in higher weight gain.

The interactive effect between levels of feed restriction and vitamin E inclusion during pregnancy on subsequent litter performance is shown in Table 4. The growing rabbits from does on 0% feed restriction with vitamin E inclusion had the highest weight gain (757 ± 126 g) while the least was obtained in growing rabbits from does on 0 (700 ± 104 g) and 15% (688 ± 122 g) feed restriction without vitamin E inclusion. The results obtained in this study could be as a result of *ad libitum* feeding of rabbit does with vitamin E inclusion during pregnancy that gave their litters higher weight gain, and this is in agreement with the work of Ebeid *et al*. (2013) that reported higher daily gain with vitamin E inclusion in growing rabbits. The feed conversion ratio was affected by the interactive effect between levels of feed restriction and vitamin E inclusion (P < 0.05). The best feed conversion ratio (4.29 ± 0.60) was obtained from growing rabbits of does restricted at 0% feed restriction with vitamin E inclusion while growing rabbits of rabbit does restricted at 15% feed restriction without vitamin E inclusion recorded the poorest FCR (4.87 ± 0.78). The result obtained in this study could be due to the inclusion of vitamin E in the diet of rabbit does during pregnancy. This result is in agreement with the work of Ebeid *et al.* (2013) who reported a better feed conversion ratio with vitamin E inclusion in growing rabbits. The reason for this justification might be that there was a positive carryover effect from the mother to the offspring.

Table 2 Effects of feed restriction levels, periods of feed restriction and vitamin E inclusion during pregnancy on post weaning performance of rabbits

Parameters	Levels of feed restriction			Periods of feed restriction				Vitamin E inclusion		
	0%	15%	P-value	15–19 days	20–24 days	25–29 days	P-value	–Vit	+Vit	P-value
Initial weight (g)	634 ± 141	605 ± 119	0.11	581 ± 104^{b}	670 ± 159^{a}	607 ± 107^{b}	0.05	645 ± 122	593 ± 134	0.22
Final weight (g)	1,363 ± 178	1,317 ± 169	0.07	1,309 ± 164	1,397 ± 209	1,315 ± 129	0.96	1,340 ± 182	1,341 ± 168	0.56
Weight gain (g)	728 ± 119	712 ± 126	0.36	727 ± 109^{a}	727 ± 142^{a}	707 ± 114^{b}	0.03	694 ± 113	747 ± 126	0.24
Total feed intake (g)	3,215 ± 131	3,248 ± 144	0.11	3,213 ± 97^{b}	3,230 ± 156^{b}	3,251 ± 154^{a}	0.01	3,257 ± 174	3,206 ± 83	0.29
Average feed intake (g)	57.42 ± 2.34	58.00 ± 2.56	0.11	57.37 ± 1.73^{b}	57.68 ± 2.78^{b}	58.07 ± 2.74^{a}	0.01	58.16 ± 3.10^{a}	57.25 ± 1.48^{b}	0.04
Feed conversion ratio	4.50 ± 0.63	4.68 ± 0.75	0.07	4.50 ± 0.61^{b}	4.57 ± 0.74^{b}	4.70 ± 0.73^{a}	0.01	4.79 ± 0.70	4.39 ± 0.64	0.07

Note: $^{a, b}$ Means in the same row with different superscripts differ significantly at $P < 0.05$

Table 3 Interactive effect between levels and periods of feed restriction during pregnancy on post weaning performance of rabbits

Levels of feed restriction	Periods of feed restriction	Initial weight (g)	Final weight (g)	Weight gain (g)	Total feed intake (g)	Average feed intake (g)	Feed conversion ratio
0%	15–19 days	550 ± 57^{d}	1,253 ± 100^{c}	703 ± 96^{bc}	3,172 ± 68^{c}	56.64 ± 1.21^{c}	4.58 ± 0.59^{abc}
	20–24 days	706 ± 176^{a}	1,485 ± 211^{a}	778 ± 145^{a}	3,256 ± 82^{ab}	58.15 ± 1.46^{ab}	4.29 ± 0.62^{c}
	25–29 days	646 ± 116^{ab}	1,351 ± 119^{b}	705 ± 97^{bc}	3,217 ± 194^{abc}	57.45 ± 3.46^{abc}	4.63 ± 0.64^{abc}
15%	15–19 days	613 ± 129^{bcd}	1,365 ± 196^{b}	751 ± 119^{ab}	3,253 ± 105^{ab}	58.10 ± 1.87^{ab}	4.42 ± 0.62^{bc}
	20–24 days	633 ± 133^{bc}	1,310 ± 169^{bc}	676 ± 122^{c}	3,203 ± 203^{bc}	57.20 ± 3.62^{bc}	4.85 ± 0.75^{a}
	25–29 days	569 ± 82^{cd}	1,278 ± 130^{bc}	709 ± 131^{bc}	3,286 ± 88^{a}	58.68 ± 1.57^{a}	4.77 ± 0.82^{ab}
P-value		0.01	0.01	0.02	0.02	0.02	0.02

Note: $^{a, b, c, d}$ Means in the same column with different superscripts differ significantly at $P < 0.05$

Table 5 shows the interactive effect between vitamin E inclusion and periods of feed restriction during pregnancy on subsequent litter performance of rabbit does. The final weight of growing rabbits was statistically higher ($P < 0.05$) in growing rabbits from does fed without vitamin E inclusion at 20–24 days of gestation (1,448 ± 218 g) which differed significantly from comparable mean values obtained for other dietary treatments. Weight gain was statistically similar for growing rabbits from rabbit does fed with or without vitamin E inclusion at any periods of feed restriction ($P = 0.08$). However, a higher weight gain obtained from growing rabbit of does fed with vitamin E inclusion during pregnancy can be attributed to the vitamin E intake during pregnancy that improved weight gain during post weaning. Average feed intake increased as the period of restriction increased with or without vitamin E inclusion. The best feed conversion ratio (4.26 ± 0.54) was obtained for growing rabbits from rabbit does fed with vitamin E inclusion at 15–19 days of gestation while growing rabbits from does fed without vitamin E inclusion at 25–29 days recorded the poorest FCR (4.91 ± 0.73).

The interactive effect between levels and periods of feed restriction and vitamin E inclusion during pregnancy on subsequent litter performance is shown in Table 6. Growing rabbits from rabbit does on 0% feed restriction at 20–24 days of gestation without vitamin E inclusion recorded statistically higher final weight (1,570 ± 146 g) while growing rabbits from rabbit does on 0% feed restriction at 15–19 days of gestation without vitamin E inclusion recorded the least final weight (1,220 ± 82 g). The final weight of growing rabbits obtained in this study could be attributed to the heavier weight obtained at the beginning of the post weaning period. Also, it could be as a result of no restriction that was applied on the rabbits does that gave their litters' higher final weight.

Weight gain of growing rabbits was influenced by the dietary treatments ($P < 0.05$). The growing rabbits from does on 0% feed restriction at 20–24 days of gestation with vitamin E inclusion (783 ± 173 g) and from does on 15% feed restriction at 15–19 days of gestation with vitamin E inclusion (790 ± 109 g) had a statistically similar mean value for weight gain which was significantly higher than the growing rabbits from does on 0% feed restriction at 25–29 days of gestation without vitamin E inclusion (643 ± 26 g) and from does on 15% feed restriction at 20–24 days of gestation without vitamin E inclusion (643 ± 112 g). The result obtained on weight gain in this study corroborate with the findings of Adeyemo (2014) who reported heavier weight gain in growing rabbits from rabbit does restricted feed during pregnancy. Feed restriction coupled with vitamin E intake during pregnancy might help in increased weight gain. This result agrees with the work of Ebeid *et al*. (2013) that reported higher daily gain with vitamin E inclusion in growing rabbits compared to the control groups. The feed conversion ratio was influenced by the dietary treatments ($P < 0.05$). Growing rabbits from rabbit does on 15% feed restriction at 15–19 days of gestation with vitamin E inclusion recorded the best feed conversion ratio (4.14 ± 0.53). This result shows better feed utilization in the growing rabbits compared to other dietary treatments.

Table 4 Interactive effect between levels of feed restriction and vitamin E inclusion during pregnancy on post weaning performance of rabbits

Levels of feed restriction	Vitamin E inclusion	Initial weight (g)	Final weight (g)	Weight gain (g)	Total feed intake (g)	Average feed intake (g)	Feed conversion ratio
0%	–Vit	662 ± 131^{a}	1,362 ± 183	700 ± 104^{b}	3,241 ± 165^{ab}	57.88 ± 2.94^{ab}	4.71 ± 0.60^{ab}
	+Vit	606 ± 146^{ab}	1,364 ± 174	757 ± 126^{a}	3,189 ± 79^{b}	56.95 ± 1.41^{b}	4.29 ± 0.60^{b}
15%	–Vit	629 ± 113^{ab}	1,317 ± 181	688 ± 122^{b}	3,272 ± 183^{a}	58.43 ± 3.26^{a}	4.87 ± 0.78^{a}
	+Vit	581 ± 121^{b}	1,317 ± 159	736 ± 127^{ab}	3,223 ± 85^{ab}	57.56 ± 1.51^{ab}	4.48 ± 0.68^{bc}
P-value		0.02	0.38	0.02	0.04	0.04	0.04

Note: $^{a, b, c}$ Means in the same column with different superscripts differ significantly at $P < 0.05$

Table 5 Interactive effect between vitamin E inclusion and periods of feed restriction during pregnancy on post weaning performance of rabbits

Vitamin E inclusion	Periods of feed restriction	Initial weight (g)	Final weight (g)	Weight gain (g)	Total feed intake (g)	Average feed intake (g)	Feed conversion ratio
–Vit	15–19 days	575 ± 86^{b}	1,273 ± 155^{b}	698 ± 110	3,246 ± 100	57.98 ± 1.79	4.73 ± 0.60^{ab}
	20–24 days	740 ± 136^{a}	1,448 ± 218^{a}	708 ± 130	3,264 ± 207	58.28 ± 3.69	4.73 ± 0.76^{ab}
	25–29 days	622 ± 72^{b}	1,298 ± 108^{b}	675 ± 99	3,260 ± 199	58.21 ± 3.55	4.91 ± 0.73^{a}
+Vit	15–19 days	588 ± 121^{b}	1,345 ± 168^{b}	756 ± 102	3,179 ± 82	56.77 ± 1.45	4.26 ± 0.54^{c}
	20–24 days	600 ± 151^{b}	1,346 ± 190^{b}	746 ± 153	3,196 ± 65	57.08 ± 1.15	4.41 ± 0.70^{bc}
	25–29 days	593 ± 133^{b}	1,331 ± 148^{b}	738 ± 122	3,243 ± 90	57.92 ± 1.61	4.49 ± 0.68^{bc}
P-value		0.02	0.03	0.08	0.08	0.08	0.03

Note: $^{a, b, c}$ Means in the same column with different superscripts differ significantly at $P < 0.05$

Table 6 Interactive effect between levels and periods of feed restriction and vitamin E inclusion during pregnancy on post weaning performance of rabbits

Levels of feed restriction	Periods of feed restriction	Vitamin E inclusion	Initial weight (g)	Final weight (g)	Weight gain (g)	Total feed intake (g)	Average feed intake (g)	Feed conversion ratio
0%	15–19 days	–Vit	536 ± 64^{e}	1,220 ± 82^{c}	683 ± 103^{bc}	3,207 ± 56^{abc}	57.28 ± 0.10^{abc}	4.77 ± 0.61^{abc}
	20–24 days	–Vit	796 ± 101^{a}	1,570 ± 146^{a}	773 ± 116^{ab}	3,307 ± 66^{a}	59.05 ± 1.17^{a}	4.35 ± 0.58^{bcde}
	25–29 days	–Vit	653 ± 55^{bc}	1,296 ± 67^{bc}	643 ± 26^{c}	3,210 ± 267^{abc}	57.33 ± 4.75^{abc}	4.99 ± 0.46^{a}
	15–19 days	+Vit	563 ± 48^{bcde}	1,286 ± 108^{bc}	723 ± 86^{abc}	3,137 ± 62^{c}	56.01 ± 1.10^{c}	4.39 ± 0.53^{bcde}
	20–24 days	+Vit	616 ± 191^{bcde}	1,400 ± 236^{b}	783 ± 173^{a}	3,206 ± 65^{abc}	57.26 ± 1.15^{abc}	4.22 ± 0.68^{de}
	25–29 days	+Vit	640 ± 157^{bcd}	1,406 ± 136^{b}	766 ± 103^{ab}	3,224 ± 84^{abc}	57.57 ± 1.49^{abc}	4.27 ± 0.60^{cde}
15%	15–19 days	–Vit	613 ± 90^{bcde}	1,326 ± 192^{bc}	713 ± 119^{abc}	3,286 ± 120^{abc}	58.68 ± 2.15^{ab}	4.69 ± 0.60^{abcd}
	20–24 days	–Vit	683 ± 146^{b}	1,326 ± 214^{bc}	643 ± 112^{c}	3,221 ± 283^{abc}	57.51 ± 5.06^{abc}	5.10 ± 0.75^{a}
	25–29 days	–Vit	591 ± 75^{bcde}	1,300 ± 140^{bc}	708 ± 131^{abc}	3,309 ± 77^{a}	59.10 ± 1.37^{a}	4.83 ± 0.74^{ab}
	15–19 days	+Vit	613 ± 163^{bcde}	1,403 ± 199^{b}	790 ± 109^{a}	3,221 ± 78^{abc}	57.52 ± 1.40^{abc}	4.14 ± 0.53^{e}
	20–24 days	+Vit	583 ± 99^{cde}	1,293 ± 115^{bc}	710 ± 126^{abc}	3,186 ± 65^{bc}	56.90 ± 1.16^{bc}	4.59 ± 0.68^{abcd}
	25–29 days	+Vit	546 ± 85de	1,256 ± 121^{c}	710 ± 135^{abc}	3,263 ± 95^{ab}	58.27 ± 1.70^{ab}	4.71 ± 0.70^{abcd}
P-value			0.01	0.01	0.02	0.02	0.02	0.03

Note: $^{a, b, c, d, e}$ Means in the same column with different superscripts differ significantly at $P < 0.05$

CONCLUSIONS

Based on the results of this finding it can be concluded that early feed restriction and level (intensity) of feed restriction during pregnancy did not have any carry-over effect during the post weaning periods of the growing rabbits. Late quantitative feed restriction during pregnancy should be avoided as the carry-over effect might be shown in the litters during the growing periods. Therefore, it can be concluded that quantitative feed restriction at 15% between 15–19 days of gestation with vitamin E inclusion during pregnancy will not have any negative carry-over effect on the litters during the growing periods as the results obtained in this study did not show any negative growth pattern of the litters or any skeletal malformation.

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