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LITTER CHARACTERISTICS AND PRE-WEANING GROWTH PERFORMANCE OF LITTERS OF NEW ZEALAND WHITE RABBIT DOES ADMINISTERED *Panax ginseng* EXTRACTS

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ABSTRACT

This study was carried out to explore the potential benefits of ginseng, respond to organic farming and increase research in rabbits. It lasted for four weeks and was carried out at the Teaching and Research Farm, Federal University of Technology, Owerri, Imo State. A total of 18 adult New Zealand White lactating rabbit does were used in a Complete Randomized Design (CRD) with three treatments; FT_1 (control), FT_2 and FT_3, containing 0, 200 and 400 mg of Panax ginseng extracts administered orally. Litter characteristics and pre-weaning growth performance of the litters were evaluated. Total milk intake (FT_1 = 850.63 g; FT_2 = 756.37 g; FT_3 = 722.47 g), total litter weight gain (FT_1 = 263.84 g; FT_2 = 240.58 g; FT_3 = 226.12 g) and litter weight at weaning (FT_1 = 479.73 g; FT_2 = 466.50 g; FT_3 = 448.77 g) were significantly ($P<0.05$) lower in the lactating rabbit does on FT_2 and FT_3.This study shows that administration of Panax ginseng extracts to lactating rabbit does decreases milk intake and weight gain of their litters.

Key words: Ginseng, growth performance, litters, rabbits, pre-weaning

INTRODUCTION

The dependence on macro livestock like cattle, sheep and goat ,coupled with the negligence of micro livestock like rabbit has been implicated as one of the reasons why the animal protein need of developing countries, like Nigeria, continue to be in shortfall (Assan, 2014). Rabbit farming in Nigeria can be adjudged to be rudimentary and has not gotten adequate commercial attention. Therefore, it is necessary to widen studies in rabbit farming if it must attain adequate commercial status.

In the quest to develop rabbit farming in Nigeria, it will be appropriate to align it with the advocacy for organic farming. One of the ways of achieving this will be through the use of non-synthetic materials for various purposes of improved performance, against the use of synthetic materials with adverse residual effects (Iwuji and Herbert, 2012). The non-synthetic materials usually employed in animal studies are those of plant origin, of which one of them is ginseng, which has recorded some positive results (Iwuji, 2016).

Utilization of *Panax ginseng* in rabbits has recorded positive results in growth, blood constituents, immunity and male reproduction (Iwuji *et al.*, 2018; 2019; 2020). These potentials informed this study, designed to evaluate the litter characteristics and pre-weaning growth performance of rabbit does administered *Panax ginseng* extracts.

MATERIALS AND METHODS

This experiment was carried out at the Rabbitry Unit of the Teaching and Research Farm, Federal University of Technology, Owerri, Imo State. A total of 18 lactating New Zealand White (NZW) rabbits were divided into 3 groups on litter weight equalization basis and randomly assigned to three treatments (FT_1, FT_2 and FT_3) with 3 replicates containing 2 rabbits per replicate. *Panax ginseng* extracts were administered orally to lactating does daily, at 0, 200 and 400 mg for FT_1, FT_2 and FT_3, respectively.

After 24 hours of parturition, the does were separated from the kits and subsequently allowed 3 minutes access to their kits for monitored suckling twice daily (morning and evening). The litter size and mean litter weight at birth were recorded after parturition, and thereafter, weekly weights of the litters were measured and recorded, while litter size and mean litter weight at weaning were recorded after 28 days of birth. Pre-weaning mortality was recorded between parturition and weaning. Average daily litter weight gain for each week was calculated by dividing each

week's total litter weight gain by 7 days. Average daily litter weight gain for the total period of 4 weeks (1 – 28 days) was calculated by dividing the total litter weight gain by 28 days.

Growth performance evaluation of the litters of the experimental rabbit does were carried out for the first 3 weeks after kindling. This is when the litters depend solely on the dam's milk (Mahmoud, 2013). Milk intake of the litters was calculated from the change in weights of the does before and after suckling. Parameters used in evaluating the pre-weaning growth performance were litter weight at birth, litter weight at 3 weeks, total and daily weight gain, total and daily milk intake, milk conversion ratio and mortality.

Data collected were subjected to analysis of variance using SAS (2002) and significantly ($P<0.05$) different treatment means were separated using the same software.

RESULTS AND DISCUSSION

Litters of does on FT_1 (479.73 g) and FT_2 (466.50 g) had similar ($P>0.05$) mean weaning weights, but mean litter weight at weaning of does on FT_1 was significantly ($P<0.05$) higher than mean litter weight at weaning of does on FT_3 (448.77 g) which was similar to mean litter weight at weaning of does on FT_2 (Table 1).

All other parameters measured were similar among the treatments, except litter weight at weaning which decreased in the rabbit does receiving PGEs, and became significant at 400 mg administration of the extracts. Weight of dam has correlation with some litter characteristics (Mahmoud, 2013); the similar ($P>0.05$) weight of the dams used in this study indicates that it did not contribute to the variation recorded in the litter weight at weaning. Since all the litters were allowed equal time for suckling, it could be that the dams treated with PGEs were producing lesser milk than dams not treated with PGEs.

Table 1: Litter characteristics of rabbit does administered PGEs

Parameters	FT_1	FT_2	FT_3	SEM
Body weight of dams (g)	2297.67	2279.67	2383.33	35.55
Litter size at birth	6.33	6.33	6.67	0.14
Mean litter wt. at birth (g)	44.26	43.95	42.55	0.69
Litter size at weaning	5.33	5.33	5.66	0.21
Mean litter wt. at weaning (g)	479.73^{a}	466.50^{ab}	448.77^{b}	9.45

^{ab}: Means within a row with different superscripts are significantly ($P<0.05$) different. FT = Female treatment; SEM = Standard error of means, PGEs = *Panax ginseng* Extracts.

In week one, average litter weights of rabbit does on FT_2 (91.50 g) and FT_3 (88.13 g) were similar ($P>0.05$), but significantly ($P<0.05$) lower than average litter weight of rabbit does on FT_1 (98.53 g) (Table 2). A significantly ($P<0.05$) higher average litter weight for rabbit does on FT_1 (175.33 g) was recorded in week two than for rabbit does on FT_2 (164.17 g) which was significantly ($P<0.05$) higher than average litter weight for rabbit does on FT_3 (155.43 g). In week three, average litter weight for rabbit does on FT_1 (308.10 g) was significantly ($P<0.05$) higher than average litter weight for rabbit does on FT_2 (284.53 g) which was significantly ($P<0.05$) higher than average litter weight for rabbit does on FT_3 (268.67 g). Average litter weights in week four were similar ($P>0.05$) for rabbit does on FT_1 (479.73 g) and FT_2 (466.50 g), but litter weight of rabbit does on FT_2 was similar ($P>0.05$) to litter weight of rabbit does on FT_3 (448.77 g) which was significantly ($P<0.05$) lower than litter weight of rabbit does on FT_1.

Weekly litter weights of rabbit does receiving PGEs were significantly lower than weekly litter weights of rabbits does on the control treatment. This significant decrease in litter weights of does treated with PGEs were similar in week one between FT_2 and FT_3, but significantly higher in a dose dependent manner in weeks 2 and 3, while week 4 recorded mean litter weight of does on FT_3 (400 mg of PGEs) that was similar to mean litter weight of does on FT_2 (200 mg of PGEs), but significantly lower than mean litter weight of does on FT_1 (control; 0.00 mg of PGEs) which was similar to FT_2. The weekly litter weight pattern exhibited in this study is probably correlated to the pattern of milk intake and growth of the litters (Mahmoud, 2013; Gaafar *et al*., 2014). Furthermore, during the fourth week of lactation, there is likely a drop in milk yield of the lactating rabbits and their litters would also have reduced dependence on milk and started eating some pelleted feeds (Mahmoud, 2013) which supplemented the reduced milk yield. The phenomenon of compensatory growth must have probably led to the litter weight of rabbits does on FT_2 to

meet up with the litter weight of rabbit does on FT_1; and the litter weight of rabbit does on FT_3 to meet up with the litter weight of rabbit does on FT_2.

Table 2 Weekly average litter weights (g) of rabbit does administered PGEs.

Weeks	FT_1	FT_2	FT_3	SEM
1	98.53[a]	91.50[b]	88.13[b]	1.22
2	175.33[a]	164.17[b]	155.43[c]	2.67
3	308.10[a]	284.53[b]	268.67[c]	4.29
4	479.73[a]	466.50[ab]	448.77[b]	9.45

[abc]: Means within a row with different superscripts are significantly (P<0.05) different. FT = Female treatment; SEM = Standard error of means.

Week one of the weekly weight gain of the litters (Table 3) recorded significantly (P<0.05) higher weight gain of litters of does on FT_1 (54.27 g) than for litters of rabbit does on FT_2 (47.55 g) and FT3 (45.58 g) which were similar (P>0.05). In weeks 2 and 3, average weight gains of litters of rabbits on FT_1 (76.80 and 132.77 g for weeks 2 and 3, respectively) were significantly (P<0.05) higher than average weight gains of litters of rabbits on FT_2 (72.67 and 120.36 g for weeks 2 and 3, respectively), which was significantly (P<0.05) higher than average weight gains of litters of rabbits on FT_3 (67.30 and 113.24 g for weeks 2 and 3, respectively). In week four, similar (P>0.05) weight gains of litters were recorded for rabbits on FT_2 (181.97 g) and FT_3 (180.10 g) which were significantly (P<0.05) higher than weight gain of litters of rabbits on FT_1 (171.63 g). Total weight gain of litters from FT_1 (435.47 g) was significantly (P<0.05) higher those of litters from FT_2 (422.55 g), which was significantly (P<0.05) higher than total weight gain of litters from FT_3 (406.22 g). Daily weight gain in week three was significantly (P<0.05) higher in litters of rabbit does on FT_1 (18.97 g) than in litters of rabbits does in FT_2 (17.19 g) and FT_3 (16.18 g) which were similar (P>0.05). Similar (P>0.05) daily litter weight gains were recorded in weeks 1, 2 and 4 and 1 – 4, except in week 3 when the daily weight gain of the kits of does on FT_1 exceeded (P<0.05) those of kits of does on FT_2 and FT_3.

The weekly litter weight gains of the lactating rabbit does followed same pattern as in the weekly litter weights, except for in week four which recorded a similar litter weight gain in FT_2 and FT_3 which were significantly higher than litter weight gain of FT_1; confirming the phenomenon of compensatory growth in litters of FT_2 and FT_3 in the fourth week of lactation.

Table 3 Weekly average weight gain (g) of litters of does administered PGEs

Weeks	FT_1	FT_2	FT_3	SEM
1	54.27[a]	47.55[b]	45.58[b]	1.02
2	76.80[a]	72.67[b]	67.30[c]	1.21
3	132.77[a]	120.36[b]	113.24[c]	2.14
4	171.63[b]	181.97[a]	180.10[a]	2.46

[abc]: Means within a row with different superscripts are significantly (P<0.05) different. FT = Female treatment; SEM = Standard error of means.

Table 4 presents the pre-weaning (3 weeks) growth performance of litters of rabbit does administered PGEs. Average litter weight of the rabbit does among the treatments significantly (P<0.05) decreased in a dose-dependent manner and were 308.10, 284.53 and 268.67 g for FT_1, FT_2 and FT_3, respectively. Total weight gain of the litters was significantly (P<0.05) higher in rabbit does on FT_1 (263.84 g) than in rabbit does on FT_2 (240.58 g) which was significantly (P<0.05) higher than total weight gain of litters of rabbits on FT_3 (226.12 g). Daily weight gain was similar (P>0.05) between litters of rabbit does on FT_1 (12.56 g) and FT_2 (11.46 g), but daily weight gain of the litters of rabbit does on FT_1 was significantly (P<0.05) higher than daily weight gain of the litters of rabbit does on FT_3 (10.77 g) which was similar (P>0.05) to the daily weight gain of litters of rabbit does on FT_2. Total milk intake of the litters was significantly (P<0.05) higher for litters of rabbit does on FT_1 (850.63 g) than for litters of rabbit does on FT_2 (756.37 g) which was significantly (P<0.05) higher than litters of rabbit does on FT_3 (722.47 g). Daily milk

intake was similar (P>0.05) between litters of rabbit does on FT_1 (40.51 g) and FT_2 (36.02 g), but daily milk intake of the litters of rabbit does on FT_1 was significantly (P<0.05) higher than daily milk intake of the litters of rabbit does on FT_3 (34.40 g) which was similar (P>0.05) to daily milk intake of the litters of rabbit does on FT_2. Average litter weight at birth, milk conversion ratio and mortality were similar (P>0.05) among the experimental treatment groups.

Growth performance evaluation of litters of the experimental lactating rabbit does in the first 3 weeks following kindling, recorded a dose dependent significant decreases in average litter weights, total weight gain and total milk intake. Daily weight gain and daily milk intake of the litters reduced as the level of PGEs increased in their dams; and became significantly lower in FT_3 (400 mg of PGEs) than in FT_1 (0.00 mg of PGEs). Since average weights at birth and milk conversion ratios of the litters were similar among the experimental treatments, it became obvious that the poor performances of the litters of lactating rabbit does on FT_2 and FT_3 were caused by their inability to get enough feed (milk) due to lower milk yield of their dams as a result of the administration of PGEs, which probably inhibited the release of prolactin necessary for milk production (Murphy and Lee, 2002).

Table 4 Pre-weaning (3 weeks) growth performance of litters of rabbit does administered PGEs

Parameters	FT_1	FT_2	FT_3	SEM
Average litter weight at birth (g)	44.26	43.95	42.55	0.69
Average litter weight at 3 weeks (g)	308.10^{a}	284.53^{b}	268.67^{c}	4.29
Total weight gain (g)	263.84^{a}	240.58^{b}	226.12^{c}	4.18
Daily weight gain (g)	12.56^{a}	11.46^{ab}	10.77^{b}	0.56
Total milk intake (g)	850.63^{a}	756.37^{b}	722.47^{c}	8.32
Daily milk intake (g)	40.51^{a}	36.02^{ab}	34.40^{b}	1.98
Milk conversion ratio (g milk/g gain)	3.23	3.14	3.19	0.12
Mortality (%)	2.63	2.63	2.50	0.14

^{abc}: Means within a row with different superscripts are significantly (P<0.05) different. FT = Female treatment; SEM = Standard error of means.

CONCLUSION

This study demonstrates that administering *Panax ginseng* extracts to lactating New Zealand White rabbit does negatively affects their litter characteristics and their pre-weaning growth performance.

RECOMMENDATION

It is recommended that *Panax ginseng* extracts should not be administered to lactating rabbit does.

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