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EFFECT OF PROTEIN FLUSHING ON REPRODUCTIVE PERFORMANCE OF MULTIPAROUS DOES.

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Target Audience: Reproductive physiologists, rabbit producers

ABSTRACT

A study was conducted to investigate the effect of flushing using protein levels on reproductive performance of rabbits. Thirty (30) multiparous does were flushed with four protein (18, 20, 22 and 24% CP) diets one week before and after mating. The does were placed on the 18% CP diet during pregnancy and lactation. Litter size and weights at birth and at weekly intervals and kit mortality were measured.

Results obtained showed no significant effect (P>0.05) of level of protein on litter parameters. Multiparous does flushed with 22% CP diet had larger litter size at birth followed by does fed 24%, 18% and 20% CP diets. Does flushed with 24% CP diet however, had larger litter sizes at one, two and three weeks of lactation. The trend was similar for litter birth weight and litter weights at one, two and three weeks of lactation. Average daily litter and kit weight gains were similar for all treatments. Does flushed with 20% CP diet had highest feed cost/kit produced at birth while does flushed with 18% CP diet had the highest feed cost/kit at 21 days postpartum. There was no difference in stillbirth and kit mortality for all the treatments in the periods studied.

Keywords: Protein, flushing, performance, multiparous does

DESCRIPTION OF PROBLEM

The potential of the rabbit to meet the demand for animal protein in Nigeria cannot be overemphasized. This is in view of its short generation interval and high litter size. Over the years, however, productivity of the local rabbit in terms of litter size and growth rate has declined below the achievable potential of the animal. It is therefore, very important that steps are taken to improve the productivity as this is a determinant of profitability of rabbit production enterprises (15). One way to increase productivity is an increase in fertility level, litter size and milk production of the doe (10), as this would increase the number

of rabbits available for sale and consumption.

A technique to achieve this aim is the short-term increase in plane of nutrition of the doe at ovulation (flushing). Flushing, defined as the process of improving nutrition to induce ovulation rate (6), involves improving the quantity and composition of feedstuff available to animals in two or three weeks at the onset of the breeding season (5). Several works have been reported on flushing using increased quantity of feed in pigs (16,3,22,1) and ewes (5,21,17). There is however very little work done on the quality of the feed for flushing and the effect of this on rabbit productivity. This study was therefore, conducted to investigate the effect of flushing multiparous (several parity) does using different protein levels on litter size and weight of kits.

MATERIALS AND METHODS

This study was conducted at the National Animal Production Research Institute between December and April to investigate the effect of flushing using different protein levels on the reproductive performance of rabbits. Thirty multiparous does were used. Does were housed individually in cages. The does were randomly assigned to four protein diets: 18, 20, 22 or 24% CP (Table 1) one week before and after mating.

Table 1. Composition of experimental diets fed to multiparous does.

	Treatment (% CP)			
Ingredient	18	20	22	24
Maize	48.00	45.73	39.24	32.76
Groundnut cake	33.70	35.77	42.26	48.74
Maize offal	15.00	15.00	15.00	15.00
Bone meal	2.80	3.00	3.00	3.00
Salt	0.30	0.25	0.25	0.25
Vit./mineral premix	0.30	0.25	0.25	0.25
Calculated content:				
Energy (Kcal ME/kg)	2638.90	2687.74	2627.43	2567.19
Crude protein (%)	18	20	22	24
Crude fibre (%)	3.07	4.17	4.24	4.31
Ash	5.34	2.68	2.96	3.23
Feed cost (N/kg)	40.59	37.09	39.30	41.52

Vit./mineral premix content per kilogramme ration: Vit. A 1251 IU, Vit. D3 2750 IU, Vit. E 151 IU, Vit. K 0.002g, Vit. B_2 0.006g, Nicotinic acid 0.035, Calcium D-Pantothenate 0.01mg, Vit. B_6 0.0035g, Vit. B_{12} 0.02g, Folic acid 0.001g, Biotin 0.0005g, Vit. C 0.025g, Cholin chloride 0.39g, Zinc bacitracin 0.02g, Methionine 0.2g, Avatec (Lasolocid) 0.09g, Manganese 0.1g, Iron 0.05g, Zinc 0.04g, Copper 0.002g, Iodine 0.00153g, Cobalt 0.000225g, Selenium 0.0001g.

After flushing, all the does were placed on the 18% CP diet through pregnancy and lactation. Prior to flushing does were fed 18% CP diet. During flushing, the does were supplied 120g diet daily in the morning and Digitaria grass hay in the evening. After flushing, all does were fed *ad libitum* during pregnancy and lactation. Water was supplied daily. Nesting boxes were supplied to does on the 25th day of pregnancy. Litter sizes, litter weights and kit mortality were monitored at birth and at weekly intervals up to three weeks of age. Feed cost/kit produced at birth and 21 days postpartum was determined by computing the cost of feeding the doe from flushing up to kindling and 21 days postpartum, divided by the number of kits produced at birth and litter size alive at 21 days postpartum. Data collected were subjected to analysis of variance test using general linear model (19).

RESULTS AND DISCUSSION

Analysis of variance results obtained indicated non-significant effect ($P>0.05$) of protein level during flushing on all parameters measured. This agrees with the report of (12) that variations in nutrient intake had very minor or no effect on ovulation rate in the rabbit. Altering dietary protein levels in pigs has also not been found to enhance ovulation rates above those for conventional diets (17).

Multiparous does flushed with 22%CP diet had slightly larger total litter size at birth and litter size alive at birth (Table 2) than those flushed with 24, 18 and 20%CP diets. However, multiparous does flushed with the 24% CP diets had slightly larger litter size at weeks one to three of lactation.

Table 2. Effect of protein flushing on litter size of multiparous does.

	Crude protein (%)			
Litter size	18	20	22	24
At birth (LSP)	5.14±0.62	4.00±0.74	6.50±0.58	5.70±0.52
Alive at birth (LSA)	4.00±0.82	2.80±0.97	4.25±0.77	4.10±0.69
7 days postpartum	2.86±0.86	1.60±1.02	3.25±0.80	3.90±0.72
14 days postpartum	2.57±0.87	1.60±1.03	2.75±0.81	3.70±0.72
21 days postpartum	2.57±0.86	1.60±1.01	2.75±0.80	3.50±0.72
Cost/kit at birth (₦)	34.92	43.75	33.56	37.37
Cost/kit at 21 days postpartum (₦)	104.45	86.97	99.41	88.74

This result agrees with the report of Sanchez *et al.*, (18) who observed no differences in litter size of New Zealand White does fed diets containing 17.5, 19 or 20.5% CP. A non-significant increase in litter size with 22 and 26% protein over 10, 14 and 18% protein was reported by (11). The fact that multiparous does flushed with 24% CP had larger litter sizes at weeks one to

three of lactation would suggest that flushing with 24% CP might have improved mothering ability of does probably by increasing milk production. For does suckling eight kits, an increase in the CP intake was accompanied by significantly higher milk output of the does (13). Though milk production was not measured in this study, litter size and weight at 21 days have been reported to be a very good evaluation of the does maternal ability as the young depend solely on the dams milk up to that age (4). Considering that all the does were on the same protein diet during pregnancy and lactation, it would appear therefore, that the differences in ability to raise more kits up to 21 days observed for does flushed with the 24% CP diet could be as a result of a carry-over effect of protein accretion during flushing.

Feed cost/kit produced at birth (Table 2) was highest for does flushed with 20% CP diet and lowest for does flushed with 22% CP diet. While feed cost/kit produced at 21 days postpartum was highest for does flushed with 18% CP diet and lowest for does flushed with 20% CP diet. Since feed cost/kit produced is a function of litter size, therefore, the larger the litter size the lower the cost per kit produced. This could be a determinant of the level of profitability expected from a rabbit production enterprise.

Table 3 shows the effect of protein flushing on litter weights of multiparous does. Litters born to multiparous does flushed with 24% CP diets had slightly heavier weights from birth to three weeks of lactation than litters of does on the other protein diets.

Table 3. Effect of protein flushing on weight (grams) changes of kits.

	Crude protein (%)			
Parameter	18	20	22	24
Litter birth weight	203.6±51.32	170.0±60.72	233.0±48.01	265.0±42.90
0-7 days PP.				
Litter wt.	310.7±91.10	170.0±107.79	350.0±85.21	400.0±76.22
Litter daily gain	19.4±7.45	10.0±8.8	22.1±6.97	20.7±6.23
Kit daily gain	5.5±1.72	2.5±2.04	5.3±1.61	4.4±1.44
7-14 days PP.				
Litter wt.	428.6±125.30	250.0±148.26	471.9±117.21	525.0±104.83
Litter daily gain	16.8±6.03	11.4±7.10	19.2±5.64	17.9±5.04
Kit daily gain	5.1±1.73	2.9±2.04	6.1±1.62	3.9±1.45
14-21 days PP.				
Litter wt.	507.1±138.12	290.0±168.42	537.5±129.20	610.0±115.56
Litter daily gain	11.2±4.00	5.7±4.73	9.4±3.74	13.6±3.34
Kit daily gain	3.3±1.18	1.4±1.39	3.3±1.10	3.5±0.98
0-21 days PP.				
Litter daily gain	15.5±4.52	9.1±5.35	16.3±4.23	16.9±3.79
Kit daily gain	4.6±1.23	2.3±1.45	4.0±1.15	3.8±1.03

PP. Postpartum.

This result is similar to that obtained by (11) with rabbits and (2,7,23) with pigs. They all reported no significant effect of dietary protein level fed during pregnancy and lactation on litter size and weight. However, (9) reported that 88.9% of total variation in 21-d litter weight was attributable to the direct effects of 1- to 21-d cumulative milk production. The report of (8) showed a correlation of 0.85 between cumulative milk production on d 1 to 21 and litter weaning weight. This further shows that the does flushed with 22 and 24% CP diet must have produced more milk to cater for their litter adequately up to 21 days.

Effect of flushing on kit mortality is shown in Table 4. The trend showed higher stillbirth and kit mortality in the first week of lactation (0-7 days postpartum) for does flushed with 20% CP than the other groups.

Table 4. Effect of flushing on kit mortality rate (%).

	Crude protein (%)			
Parameter	18	20	22	24
Stillbirth	26.84± 13.02	40.0± 15.41	28.87± 12.18	26.19± 10.89
0-7 days PP.	24.29± 13.14	44.0± 15.55	21.16± 12.29	10.0± 11.00
7-14 days PP.	8.33± 7.57	0.00± 8.96	20.83± 7.09	3.33± 6.34
14-21 days PP.	0.00± 1.87	0.00± 2.21	0.00± 1.75	4.00± 1.57
0-21 days PP.	29.52± 13.27	44.0± 15.71	32.41± 12.42	6.67± 11.10

PP. Postpartum.

The highest kit mortality was observed in the period 0-7 days postpartum. Kit mortality decreased for all the treatment groups in the periods 7-14 and 14-21 days postpartum. This result agrees with (14) who reported that over 70% of deaths occurred during the first seven days of life for rabbits. The main causes for losses of kits up till weaning is due to insufficeint milk supply and under-cooling (20).

It may be concluded from this study however, that though flushing does with different crude protein levels did not significantly affect litter size and weight, does flushed with 24% CP had slightly larger and heavier litters during lactation and lower kit mortality rate than 18, 20 and 22% CP levels. It would be cheaper on the long run for a farmer to flush his does for one week before and after mating with high protein diet and return them to the normal diet during pregnancy and lactation and obtain a higher litter size and weight of kits at weaning, therefore increasing the number of fryers available for sale or replacement stock.

REFERENCES

1. **Ashworth, C. J. (1991).** Effect of pre-mating nutritional status and the trend for litter weight alive at birth also shows a reduction in weight with increase in protein level except for does fed 24% diet. Does fed the 22% CP post-mating progesterone supplementation on embryo survival and conceptus growth in gilts. *Anim. Reprod. Sci.* 26: 311-321.
2. **Böhme, H. (1993.)** Effects of different levels of protein during pregnancy on body weight changes and reproductive performance of sows. *Pig News & Inform.* 14(4): 390 (Abstr.3264).
3. **English, P. R.; Smith, W. J. and MacLean, A. (1982.)** *The sow-improving her efficiency*: Second ed., Farming Press Ltd. Wharfedale Road, Ipswich, Suffolk. pg.82-110.
4. **Ferraz, J. B. S.; Johnson, R. K. And Eler, J. P. (1991.)** Breed and environmental effects on reproductive traits of Californian and New Zealand White rabbits. *J. Appl. Rabbit Res.* 14: 172-179.
5. **Hunter, R. H. F. (1980.)** *Physiology and technology of reproduction in female domestic animals*. Academic Press. London, New York, *Toronto, Sydney, San Francisco. pg.* 111-131.
6. **Hutchinson, J. S. M. (1993.)** *Controlling reproduction*: Chapman & Hall. London Glasgow, New York, Tokyo, Melbourne, Madras. pg. 51-60.
7. **Lember, A. (1994.)** Influence of protein level in the ration of pregnant sows on their reproductive performance. Pig News & Inform. 15(4): 393 (Abstr. 3365).
8. **Lukefahr, S. D; Cheeke, P. R. and Patton, N. M. (1990.)** Prediction and causation of litter market traits from preweaning and weaning characteristics in commercial meat rabbits. J. Anim. Sci. 68: 2222-2228.
9. **Lukefahr, S.; Hohenboken, W. D.; Cheeke, P. R. and Patton, N. (1983.)** Characterization of straight bred and crossbred rabbits for milk production and associative traits. *J. Anim. Sci.* 57(5): 1090-1098.
10. **Lukefahr, S.; Hohenboken, W. D.; Cheeke, P. R. and Patton, N. (1984.)** Genetic effects on maternal performance and litter pre- weaning and post-weaning traits in rabbits. *Anim. Prod.* 38: 293-300.
11. **Omole, T. A. (1982.)** The effect of level of dietary protein on growth and reproductive performance in rabbits. J. Appl. Rabbit Res. 5: 83 - 88.
12. **Partridge, G. G. (1989.)** Nutrition of farmed rabbits. Proceedings of the Nutrition Society. 48: 93-101.
13. **Partridge, G. G and Allan, S. J. (1982.)** The effects of different intakes of crude protein on nitrogen utilization in the pregnant and lactating rabbit. *Anim. Prod.* 35:145-155.

14. **Partridge, G. G, Foley, S and Corrigall, W. (1981.)** Reproductive performance in purebred and crossbred commercial rabbits. *Anim. Prod.* 32: 325-331.
15. **Patton, N. M. (1991.)** Rabbit herd management: techniques to reduce production costs and increase profits. *J. Appl. Rabbit Res.* 14:136-139.
16. **Pike, I. H. and Boaz, T. G. (1972.)** The effect of condition at service and plane of nutrition in early pregnancy in the sow. *Anim. Prod.* 15:147-155.
17. **Robinson, J. J. (1990.)** Nutrition in the reproduction of farm animals. *Nutr. Res. Rev.* 3: 253-276
18. **Sanchez, W. K.; Cheeke, P. R. And Patton, N. M. (1985.)** Effect of dietarycrude protein level on the reproductive performance and growth of New Zealand White rabbits. Nutr. Abstr. Rev. Series B. 55(11): 675.
19. **SAS. 1987. *Institute Inc.* (1987.)** *SAS/STAST. Guide for personal computers*. Version 6. ed. pp. 697-978.
20. **Schlolaut, W. (1980.)** Trends in the development of rabbit production and related technical problems. Anim. Res. and Devt. (GDR) 11: 110-116.
21. **Smith, J. F., Payne, E., Peterson, AJ., McGowan, LT., Cope, B. and McLaughlin, R. (1990.)** Effects of phenobarbital, dietary protein intake, and ewe liveweight on ovulation rate and concentrations of plasma FSH and hepatic microsomal enzymes. Reprod. Fertil. Dev., 2:623-632.
22. **Toplis, P. (1882.)** Feeding the breeding pig profitably. Formulations Manager, RHM Agriculture Ltd. Reprinted from the Feed Compounder January 1982. Printed by The Creative Press (Reading) Ltd. 7pg.
23. **Weeden, T. L.; Nelssen, J. L.; Thaler, R. C.; Fitzner, G. E. and Goodband, R. D. (1994.)** Effect of dietary protein and supplemental soyabean oil fed during lactation on sow and litter performance through two parities. *Pig News & Inform.* 15(2):180 (Abstr.1514).