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The effect of feeding decreasing levels of pelleted concentrate and *ad libitum* forages on reproductive performance of Rabbits: Effect on doe weight changes, litter characteristics at birth and at weaning

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Abstract

Twenty five does were randomly allocated to five feeding levels in groups of five, in order to determine the minimum level of pelleted concentrate (Pc) that would be required to sustain acceptable level of litter performance at birth and at weaning, while making *Aspilia africana* and *Ipomea batata* vines freely available. The feeding levels were *Ad libitum* commercially compounded rabbit pellet (*Ad libitum* PC), 100% PC *Ad libitum Aspillia Sp* (100% PC + F), 75% PC + F, 50% PC + F and 25% PC + F. The does were maintained on these ratios through five successive pregnancies had no effect on doe's weight gain over pregnancy, gestation length and litter characteristic (P>0.05). In effect does can be maintained on 25% of their *ad libitum* intake of PC or an average 33 grams per day without adverse effects on performance. Results also indicated that lactating does should not be supplied less than 50% of their *Ad libitum* intake of PC or 15 gram/doe and kid/day provided forage was freely available.

Introduction

The ability of rabbits to utilise large quantities of herbage in their diet has been recognised for quite some time. Nearly all successful rations for rabbits involved a large amount of green feed (MacDonald 1933). It has been suggested that rabbits could be grazed on grass in poultry runs without any other feed offered. Others, (Wilson, 1944) cautioned that exclusive diets of greens and hay falls very near to minimum requirement of rabbits when fed at sufficient levels. Harris *et al.* (1981) suggested that 54% and 74% level of alfafa in breeding and gestation diets respectively was better than rations containing lucern. The effects of the feeding of forages on lactating does and their progency has been evaluated. Total 28 day litter weight, feed efficiency of does and their litters and survivability was better for does when their diet was made up of 54% alfafa compared to does feed exclusively on a commercial diet. (Harris *et al.* 1981).

Rabbit producers in Nigeria have, in recent times, increased the quantity of forages fed rabbits while drastically reducing the quantity of rabbit pellets offered, and in some cases no pellets are offered resulting in high mortality of both adult and young animals as well as poor reproductive performance (Unpublished, 1990). The present experiment was therefore designed to investigate the effect of feeding varying levels of a popular commercially pelleted rabbit pellet along with *ad libitum* mixture of Aspilia *africana* and *Ipomea batata* on gestation and litter characteristics at birth and at weaning.

Materials and Methods

Twenty five first and second parity does weighing between 1.7 and 2.1 kilogrammes and ranging in ages between 7 months and one year, were fed a commercial rabbit pellet *ad libitum* for one week. A record of daily feed intake in grams per doe was kept and at the end of one week, mean feed intake per doe per day was calculated. Starting in the second week, the does were randomly allocated in groups of five per treatment to five feeding regimes. Group 1, *Ad libitum* commercial pellet as sole feed (*Ad libitum* PC); Group 2, 100% commercial pellet along with *ad libitum* supply of *Aspilia africana* and *Ipomea batata* (100% PC + F), 100% pellet ration was the mean of the pellet intake of group one does the previous day. Group 3, 75% PC + F; Group 4, 50% PC + F; and Group 5, 25% PC + F. A record of daily pellet intake was kept for all does and the quantity of pellets offered groups two to five does based on the mean quantity of pellet intake of group one does the previous day. The quantity of forage intake; Samples of pellets from each bag purchased and samples of forage every two weeks were taken for proximate analysis. Commencing on the third week of the experiment each doe was taken to a buck for mating. Does were tested with three different bucks before being recorded as not mating if they refused all three bucks. After mating, does weight and mating dates were recorded. This procedure was followed daily until all does were mated. 14 days post coitum, does were palpated abdominantly for pregnancy. Does not pregnant were immediately remated. Twenty five days post coitum, washed and disinfected kidding boxes were supplied. At kidding gestation length in days, litter size litter birth weight in grams, and still birth were recorded.

The quantity of feed offered after kidding was adjusted by litter size. Total quantity of feed consumed by group one does and their litter was divided by the total number of kids and does in group one. This represented 100% PC intake per does and kid. The 75% PC, 50% PC and 25% PC were calculated. Each doe was then fed based on the number of kids it was nursing. All kids were weaned at 4 weeks of age. At weaning, doe weight loss, litter size and litter weight were recorded. The feeding regime was imposed over five successive pregnancies and lactations.

The effect of feeding level on doe weight changes and litter characteristics were analysed using one way analysis of variance and means were compared by Dunchan's New Multiple Range Test as outlined by Steel and Torrie (1960).

Results and Discussion

Table 1 presents the proximate composition of commercially pelleted concentrate, *Aspillia africana* and *Ipomea batata* vines. The most striking difference between the PC and forages is the dry matter content which were 88.7%, 21.2% and 14.1% for PC, *Aspilia Sp*, and *Ipomea SP* respectively. It seems unlikely that rabbits maintained solely on these forages will be able to meet their maintenance requirement let alone pregnancy and lactation. The crude fibre content of *Aspilia Sp* and

TABLE 1: PROXIMATE COMPOSITION OF *ASPILIA AFRICANA* (AA), *IPOMEA BATATA* VINES (IB) AND RABBIT PELLETED CONCENTRATE (PC)

Item	AA	IB	PC
Dry matter %	221.2	14.1	88.7
Gross energy (MJ/kg)	14.55	18.18	17.35
Crude fibre %	21.0	12.0	9.9
Protein %	12.8	12.4	18.8
Ash	13.5	11.1	9.3

AA = *Aspilia africana*

IB = *Ipomea batata*

PC = *Pelleted concentrate*

TABLE 2: THE EFFECT OF FEEDING LEVEL OF DOE DURING PREGNANCY ON FEED INTAKE AND LITTER CHARACTERISTICS AT BIRTH

Item	Ad libitum P.C.	100% PC + F	75% PC + F	50% PC + F	25% PC + F
Mean PC intake per doe/day (g)	125.4± 1.5 125.4±1.5	84.9±11.4	62.9±5.0	33.3±0.1	
Mean forage intake per doe/day (g)	—	302.6±19.6	338.8±35.7	685.6±21.2	856.0±4.11
Mean dry matter intake per doe/day (g)	111.20	140.6	135.2	177.1	181.0
Mean Gestation length (days)	31.5±1.3[a]	31.0±1.0[a]	31.6±1.5[a]	31.0±1.5[a]	30.5±0.6[a]
Mean weight gain over pregnancy (g)	740.0±92.9[a]	887.0±64.8[a]	723.492.2[a]	868.9±64.7[a]	843.5±27.9[a]
Mean litter birth weight (g)	278.0±70.9[a]	307.0±40.8[a]	334.4±75.2[a]	336.9±50.9[a]	332.5±82.9[a]
Mean litter size per doe	5.6±1.5[a]	5.8±0.1[a]	6.6±1.7[a]	5.6±1.3[a]	

Estimate

Means with the same superscript within rows are not significantly different (P 0.05).

Ad libitum PC = pelleted concentrate alone

100% PC + F 100% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*

75% PC + F 75% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*

80% PC + F 80% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*

25% PC + F 25% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*

TABLE 3: THE EFFECT OF FEEDING LEVEL OF DOE AND LITTER DURING LACTATION ON FEED INTAKE AND INTAKE AND LITTER CHARACTERISTICS AT WEANING.

Item	*Ad libitum* PC + F	100% PC + F	75% PC + F	50% PC +F	25% PC + F
Mean PC intake/doe and Kid/day (g)	33.8±3.4	30.7±1.2	22.7±0.8	15.0±0.8	7.4±0.1
Mean forage intake/doe and kid/day (g)	—	98.6±18.2	120.4±25.0	220.5±12.5	268.8±8.3
Mean dry matter intake/ doe and kid/day	29.9	45.9	48.3	50.5	52.2
Mean Litter weaning weight (g)	324.7±38.0^{ab}	396.1±12.2^{a}	327.9±30.7^{ab}	303.2±26.0^{b}	216.8±10.1^{c}
Mean litter size/doe	5.5±0.5^{a}	5.6±0.5^{a}	6.0±0.7^{a}	5.3±0.6^{a}	7.5±0.7^{a}
Mean doe weight loss during lactation (g)	75.0±62.9^{a}	125.3±51.0^{a}	175.2±94.7^{a}	300.8±97.1^{b}	429.5±62.9^{b}
Kid mortality %	10	0	0	0	0
Doe motality %	0	0	10	0	10
Kid ADG to 3wks (g/day)	5.9±0.8^{a}	8.6±0.9^{a}	6.4±0.8^{ab}	6.6±0.7^{ab}	4.7±0.2^{b}
Kid ADG to 5wks (g/day)	7.9±1.0^{ab}	9.5±0.5^{a}	7.9±0.8^{ab}	6.8±0.7^{bc}	4.9±0.3^{c}

Mean with the same superscript within rows are not significantly different (P>0.05)
Ad libitum PC = pelleted concentrate alone
100% PC + F 100% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*
75% PC + F 75% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*
80% PC + F 80% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*
25% PC + F 25% = pelleted concentrate plus *Ad lib Aspillia africana* and *Ipomea batata*

Ipomea Sp, 21% and 17% respectively, were much higher than that of PC at 9.9%. Lebas (1988) recommended a dietary crude fibre level of 13.14% for growing rabbits and a level of 10 - 11% for lactating does. The cell wall constituents of each forage type should probably determine what level of crude fibre is acceptable. There is a need to determine the digestibility of these forages. The lower crude fibre of *Ipomea Sp* and succulence due to high moisture content probably explains the preference of rabbit for *Ipomea Sp* than *Aspilia SP* evidenced by the fact that the rabbits invariably consumed all the *Ipomea Sp* before starting on the *Aspilia Sp*.

Protein content was approximately the same for the two forages at about 12% lower than the 18% contained in the PC. Ash content was 13.5%, 11.1%, and 9.3% for *Aspilia Sp*, *Ipomea Sp* and PC respectively. Calculated Gross energy content of pellet was 17.35 MJ/kg while the energy content of *Aspilia Sp* and *Ipomea sp* were 14.55 and 18.18 MJ/kg respectively.

As expected the does increased their forage intake as the level of pellets offered decreased (Table 2). Forage intake increased from 302 grams/doe/day by 100% PC. group to 856 grams/doe/day for the 25% + F group. Estimates of dry matter intake based on an average of 17% dry matter content of the forages and 88.7% for the PC showed that the 50% PC + F and 25% PC + F groups consumed substantially more dry matter than the other two groups; Perhaps in an attempt to meet nutrient requirements from a comparatively lower dry matter source.

Gestation length, weight gain over pregnancy, litter birth weights and litter sizes were not affected by the feeding regime ($P>0.05$). In practical terms, this means that does can be maintained on an average of 33 grams/day of a pelleted concentrate containing at least 18% crude protein provided a mixture of *Aspilia sp* and *Ipomea sp* was freely offered.

In table 3, the effects of feeding level during lactation on doe weight loss and litter characteristics at weaning are presented. Litter weaning weight was highest ($P<0.05$) for the 100% PC + F group and least for the 25% PC + F group while weaning weight for the *Ad libitum* PC, 75% PC + F and 50% PC + F groups were the same. The superiority in litter weight at weaning for the 100% PC + F group over those of the *Ad libitum* PC group and the similarly between the weaning weight of the *Ad libitum* PC, 75% PC + F and the 50% PC + F groups seems to suggest that there may be some factor or nutrient supplied by the forages that was not made available to the *Ad libitum* PC group. The differences observed could not be explained on the bases of dry matter intake since the 25% PC + F group which performed worst in the trait had the highest dry matter intake. Doe weight loss during lactation was the same for the *Ad libitum* PC, 100% PC + F and 75% PC + F groups; but significantly higher for the 50% PC + F and 25% PC groups, indicating that these two groups had to mobilize more of their body reserves during lactation to support their litters. In spite of this average daily weight gain of kids to weaning at 4 weeks was higher for the 100% PC + F group at 9.5 grams/day but this was not different from the 7.9 grams/day and 7.7 grams/day recorded for the 75% PC + F and 50% PC + F groups

respectively. The lowest rate of gain of 4.9g/day was recorded for the 25% PC + F group.

It appears that does cannot be maintained on 25% of their daily pellet requirements, 7.5gramms/does/kid, during lactation if excessive doe weight loss and slow growth rate of kids is to be avoided. 50% PC of 15 grams PC/day/kid/doe appears to be the minimum level of pellets required to maintain a reasonable level of performance.

Conclusion

When fresh forages, *Aspilia africana* and *Ipomea batata* are available freely does can be maintained on about 33 gram per day of pelleted rabbit concentrate containing about 18% protein and 17.35 MJ/kg energy during pregnancy and an average of 15 grams/doe/kid/day during lactation without adversely affecting litter characteristics at birth and at weaning. This will ultimately lead to considerable saving in feed costs particularly to small scale producers who cannot afford expensive feed.

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