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## Performance of Rabbits Fed Stylo (*Stylosanthes hamata*) and Groundnut Haulm (*Arachis Hypogea*)

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### Abstract

Forty eight crossbred rabbits were used to study the performance of different age groups of rabbits fed stylo and groundnut haulms supplemented with 50g concentrate. The rabbits were allocated to three treatments: *Stylosanthes hamata* (stylo), *Arachis hypogea* (groundnut) haulms and 50:50 mixture (stygnut) of stylo and groundnut haulms, and four age groups: weaner, grower, pubertal and adult in a 3 x 4 factorial experiment in a randomized complete block design for six weeks. 150g forage and 50g concentrate were supplied to the rabbits in separate feeders in the morning at 08.00hr. Initial and final weight of rabbits fed stylo, groundnut haulms and combination of stylo and groundnut haulms was similar. Concentrate, forage and total feed intake of rabbits were similar for the treatments, however, total weight gain was higher for combination of stylo and groundnut haulms and lowest on stylo. Rabbit performance on sole and combination forages was similar except for feed conversion ratio which was significantly higher for stylo. Though feed cost was similar for the treatments, cost/kg gain was higher for stylo than combination of stylo and groundnut haulms. For the rabbit groups, concentrate, forage and total feed intake were similar however; total weight gain was double for weaners than growers, pubertal and adult rabbits. Weight gain and feed conversion ratio were significantly higher for weaners than growers, pubertal and adult rabbits. Feed cost and cost/kg gain was significantly higher for adult rabbits than weaners but similar with growers and pubertal rabbits. This study shows the potential of feeding several legumes to rabbits and also implies that studies with feed resources should extend beyond weaner and/or grower phase to give practical insight into the performance of rabbits up to market weight.

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**Keywords:** stylosanthes, groundnut haulms, performance, rabbits

### Introduction

Rabbit production has over the years gained recognition both as a potential source of income and a healthy way of providing nourishment for the family and general populace. In developing countries, rabbit rearing is viewed as a means of

reducing the gap in animal protein consumption between the developed and developing countries. One of the reasons for this is that rabbits are small, easy to raise and grow very fast and therefore would be cheaper to acquire even by the poor. However, with the current trends in high

cost of feeding especially cost of concentrate diets, the natural ability of rabbits to utilize forages is being harnessed. Forages are abundant and if properly harnessed could potentially reduce cost of feeding rabbits in the tropics as the use of alfalfa in the developed countries.

Nutrient composition of legumes such as verano stylosanthes (*Stylosanthes hamata*), lablab (*Lablab purpureus*), Cowpea (*Vigna unguiculata*) and groundnut (*Arachis hypogea*) compares well with that of alfalfa (Oyawoye *et al.*, 1990). Stylosanthes is a forage legume grown for fresh feed, hay and commercial leaf meal production and used to supply protein and other nutrients for livestock (Kexian, 2000). Weaner rabbits fed stylosanthes leaf meal (SLM) in the proportions of  $\frac{1}{2}$  SLM +  $\frac{1}{2}$  feed had daily weight gain of 25.48g (Changjun *et al.*, 2004). Growing rabbits were shown to utilize low concentrate and high stylosanthes proportions efficiently for growth, even when stylo formed the bulk of the diet supplied, with only 25g concentrate (Iyeghe-Erakpotobor, 2006). Groundnut haulms have also shown great promise as a source of protein for feeding rabbits (Iyeghe-Erakpotobor *et al.*, 2002, 2006, Iyeghe-Erakpotobor, 2007) especially in the tropics.

With acceptable performance, separate free-choice offering of concentrate and forage might be employed to restrict concentrate intake and allow *ad libitum* consumption of forage as in Alpine doeling (Goetsch *et al.*, 2003). Feeding rabbit solely on forages in the tropics has resulted in negative effect of weight loss (Adegbola *et al.*, 1985; Bamikole and Ezenwa, 1999) and in

some cases positive effects have been reported (Phimmasan *et al.*, 2004, Khuc Thi Hue and Preston, 2006, Omole *et al.*, 2007). The use of compounded concentrates alone has also not given optimum results. Slow growth of rabbits under tropical conditions has also made it impossible to produce fryers by nine weeks as obtained under temperate conditions. Fryer rabbits are sold between 20 and 25 weeks old in most tropical countries. However, nutritional studies are conducted during the weaner phase (4-10 weeks) when growth is high in rabbits and do not take into consideration the slow growth of rabbits between the ages of 12 and 25 weeks (Iyeghe-Erakpotobor *et al.*, 2001) in the tropics. This period coincides with the growing, pubertal and adult phases of rabbit growth (Iyeghe-Erakpotobor *et al.*, 2001). The objective of this study was to evaluate the utilization of verano stylo and groundnut haulms supplemented with concentrate by different age groups of rabbits.

## Materials and Methods

### *Animals and housing*

New Zealand White X California crossbred rabbits of different ages and weights were used for this study. The rabbits were kept individually in metal cages (120 x 60 x 50cm) covered with wire mesh and located in a completely walled house with open windows.

### *Experimental procedure*

Forty eight rabbits were allocated to three treatments (n=16 rabbits/treatment) consisting of *Stylosanthes hamata* (verano), *Arachis hypogea*

(groundnut) haulms and 50:50 mixture of both forages, and four weight/age groups: average weights of 0.79kg (weaners), 1.15kg (growers), 1.36kg (pubertal) and 1.55kg (adult) in a 3 x 4 factorial experiment in a randomized complete block design. 150g forage and 50g concentrate were supplied to the rabbits in separate feeders in the morning at 08.00hr. Water was supplied daily in earthen pots. The concentrate (22% CP and 2600kcal ME/kg) contained (%): maize 39.24, groundnut cake 42.26, maize offal 15.00, bone meal 3.0, salt 0.25 and vitamin/mineral premix 0.25. Table 1 shows proximate composition of concentrate and forages fed. Stylo and groundnut forage were harvested, air-dried under shade and chopped into smaller sizes before feeding.

The rabbits were offered 50g concentrate and 150g forage in separate flat-bottom earthen feeders at 08.00 hour in the morning. Water was supplied *ad lib*. The rabbits were treated against ecto- and endo-parasites using 10mg/ml ivermectine (<sup>R</sup>Pantex, Holland). Concentrate and forage wastage and/or leftover were measured

daily while weight change was monitored weekly. The study lasted six weeks. Parameters monitored were feed intake and weight changes, feed conversion ratio, feed cost/kg gain. Proximate composition of the concentrate and forages used was determined according to AOAC (1980).

#### Statistical analysis

Feed intake was computed as feed offered minus feed left over and wastage. Cost of concentrate was computed at ₦38/kg and ₦20/kg bale of forage. Data collected were subjected to analysis of variance while pair-wise difference method was used to separate significant means (SAS, 1987).

## Results and Discussion

There was no interaction between forage and age group. Therefore interaction means were dropped. Initial and final weight of rabbits for the treatments were similar (Fig.1). Concentrate, forage and total feed intake of rabbits were similar for the treatments (Fig. 2), however, total

**Table 1: Proximate composition of concentrate and forages fed to grower rabbits**

	(%DM)					
	Dry matter	Ash	Ether extract	Crude fibre	Crude protein	Nitrogen free extract
Concentrate meal	96.57	6.68	12.61	10.13	21.94	48.64
<i>Stylosanthes hamata</i>	98.10	4.04	8.18	50.50	15.05	22.23
Groundnut haulms	96.94	12.77	10.35	30.43	10.84	35.61

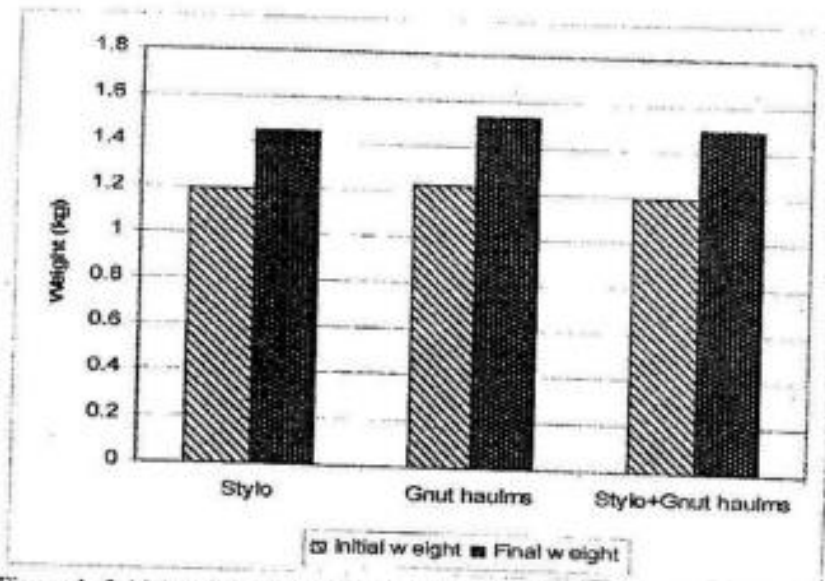


Figure 1: Initial and final weight of growing rabbits fed forage hay supplemented with concentrate. Stylo - Stylosanthes, Gnut - groundnut.

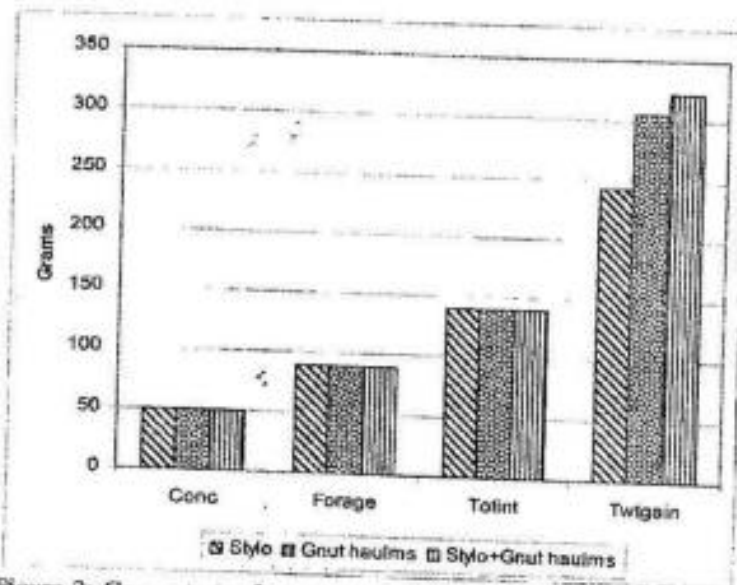


Figure 2: Concentrate, forage, total feed intake (concentrate + forage) and total weight gain of growing rabbits fed forage hay supplemented with concentrate. Conc - concentrate, totint - total feed intake, twtgain - total weight gain.

**Table 2:** Performance of rabbits fed groundnut and verano stylo forage hay supplemented with concentrate

Parameter	Verano stylo	Forage Groundnut haulms	Stylo + groundnut haulms	SE
Total intake (g/rabbit/d):	139.69	139.92	139.90	2.47
ADG (g/d)	5.80	7.26	7.69	0.88
Feed conversion (intake/gain)	42.12 <sup>b</sup>	31.46 <sup>ab</sup>	23.93 <sup>a</sup>	6.05
Feed cost (N/d)	3.70	3.70	3.69	0.048
Cost/kg gain (N)*	1114.75 <sup>a</sup>	829.78 <sup>ab</sup>	634.07 <sup>b</sup>	162.66

Means with different superscript along rows are significantly different ( $P < 0.05$ , \* $P = 0.05$ ).  
N - Naira, d - day, ADG - average daily gain

weight gain was higher for combination of verano stylo and groundnut and lowest on sole verano stylo. Performance of rabbits fed groundnut haulms, verano stylo and combination of groundnut and stylo is shown in Table 2. Rabbit performance on sole and combination forages was similar except for feed conversion ration which was significantly lower for verano stylo. Combination of groundnut haulms and verano stylo gave higher conversion ration with that for groundnut haulms being intermediate. Weight gain obtained for stylo in this study is similar to that reported by Phimmasan *et al.* (2004) but lower than daily gain of 10.7g reported by Iyeghe-Erakpotobor (2006) for growing rabbits offered 50g concentrate and 75g stylo hay. Daily weight gain of 5.8-7.7g obtained are similar with gains reported for rabbits on groundnut haulms, sweet potato and soybean forage (Iyeghe-Erakpotobor, 2007), mucuna, lablab and groundnut haulms

(Iyeghe-Erakpotobor *et al.*, 2002) supplemented with 50g concentrate. Though feed cost was similar for the treatments, cost/kg gain was higher ( $P < 0.05$ ) for verano stylo than combination of verano stylo and groundnut haulms. This could be as a result of lower weight gain by rabbits on stylo compared with the other treatments. It is likely that feeding forage legumes in combinations might show potential in reducing cost of production of rabbits. Slightly higher performance of rabbits on the combination of stylo and groundnut haulms might indicate a possibility of amino acid complementarity in the forages.

Initial and final weight of rabbits in the various groups (Fig.3) show higher weights for pubertal and adult rabbits. Concentrate, forage and total feed intake of all groups of rabbits were similar (Fig. 4) however; total weight gain was double for weaners than growers, pubertal and

*Performance of rabbits fed stylo and groundnut haulm*

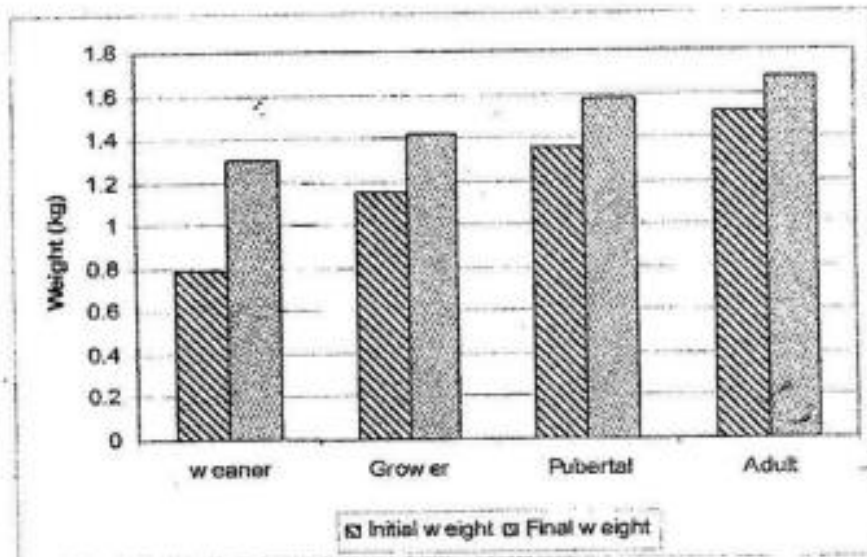


Figure 3: Initial and final weight of different classes of rabbits fed forage hay supplemented with concentrate

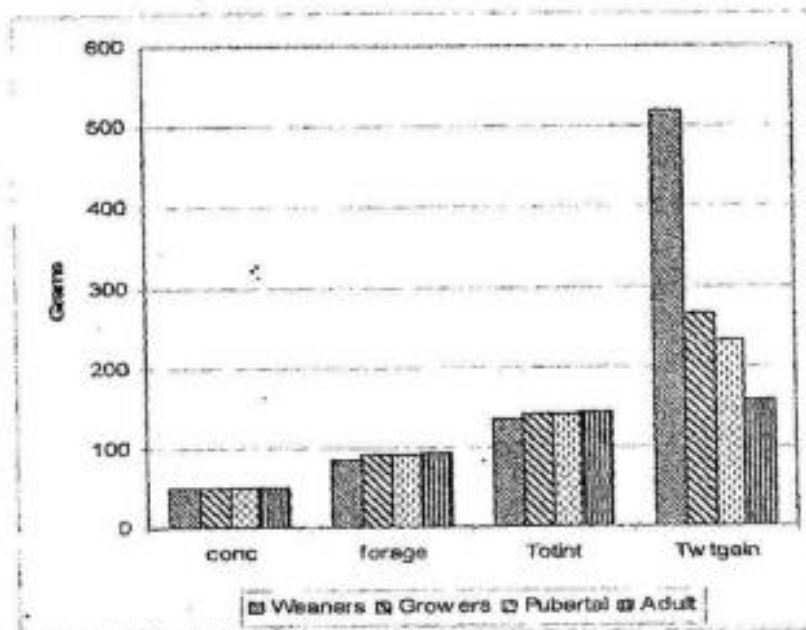


Figure 4: Concentrate, forage, total feed intake (concentrate + forage) and total weight gain of different classes of rabbits fed forage hay supplemented with concentrate. Conc - concentrate, totint - total feed intake, twt gain - total weight gain.

lowest for adult rabbits. This is expected because growth rate declines as age increases. Most nutritional studies estimate growth performance of rabbits during the weaner stage when growth rate is high. For countries where rabbits are slaughtered or sold at about 75 days of age, this would be alright, but in most developing countries, rabbits are sold at 4-6 months old when they have attained puberty or are already adults and have attained live weight of 2.4-2.5kg. The period of slow growth phase is not therefore considered and addressed by these studies.

Effect of age group on performance of rabbits fed forages is shown in Table 3. Concentrate intake was similar for all age groups. Forage and total feed intake were significantly ( $p<0.05$ ) higher for adult rabbits than weaners but similar with grower and pubertal rabbits. Weight gain and feed conversion ratio were significantly ( $p<0.05$ ) higher for weaner than growing, pubertal and adult rabbits. Feed cost and cost/kg gain was significantly ( $p<0.05$ ) higher for adult rabbits than weaners but similar

with grower and pubertal rabbits. Cost/kg gain of ₦1,114.75 obtained in this study for stylo is much higher than ₦27.20-62.30 reported for rabbits offered various levels of stylo and concentrate in an earlier study (Iyeghe-Erakpotobor, 2006). Cost/kg gain of ₦829.78 obtained for groundnut haulms in this study is also higher than ₦157.69, ₦192.67, ₦122.72 obtained in earlier studies (Iyeghe-Erakpotobor *et al.*, 2006, Iyeghe-Erakpotobor, 2007). High cost/kg gain obtained in this study for all the treatments could be as a result of the wide variations in weight of rabbits used which ranged from 0.7-1.5kg. Wide variation in cost/kg gain for weaners (₦328.13), growers (₦884.58), pubertal (₦936.75) and adults (₦1288.47) could indicate the effect of age/weight group on cost of feeding on kilogram weight gain obtained for short term studies and long term studies.

### Conclusion

This study showed better performance of rabbits on combination of forages than sole

**Table 3:** Effect of age group on performance of rabbits fed groundnut and verano stylo forage hay supplemented with concentrate

Parameter	Group				SE
	Weaners	Growers	Pubertal	Adult	
Total intake (g/rabbit/d)	134.41 <sup>b</sup>	140.59 <sup>ab</sup>	141.06 <sup>ab</sup>	143.15 <sup>a</sup>	2.86
ADG (g/d)	12.34 <sup>a</sup>	6.35 <sup>b</sup>	5.55 <sup>b</sup>	3.77 <sup>b</sup>	1.05
Feed conversion (intake/gain)	12.29 <sup>a</sup>	33.41 <sup>b</sup>	31.75 <sup>b</sup>	48.75 <sup>b</sup>	8.23
Feed cost (N/d)	3.58 <sup>b</sup>	3.70 <sup>ab</sup>	3.72 <sup>ab</sup>	3.76 <sup>a</sup>	0.06
Cost/kg gain (N)	328.13 <sup>b</sup>	884.58 <sup>a</sup>	936.75 <sup>a</sup>	1288.47 <sup>a</sup>	151.27

Means with different superscript along rows are significantly different ( $P<0.05$ ).  
N - Naira, d - day, ADG - average daily gain

forage. Weaner rabbits performed better than grower, pubertal and adult rabbits. Rabbits are however, kept for longer periods than the weaner phase before sale, during which performance is low. There is need to improve performance of rabbits during the period of slow growth in order to reduce cost of production.

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(Received 17th Sept., 2008; Accepted 20th Dec., 2008)