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Research Article

Comparative Growth Performance in Post-Weaned Guinea Pigs (*Cavia Porcellus* L) Fed with *Panicum Maximum* or *Pennisetum Purpureum*.

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Abstract

To compare the growth performance of guinea pigs fed with *Panicum maximum* or *Pennisetum purpureum*, 24 weaned guinea pigs, divided into 2 lots of 12 animals (7 males and 5 females) each were used. Animals in each lot received *ad libitum* grass associated with 20g / animal / day of a compound feed containing 16% of crude protein. The results show that at 8 weeks of age, the average weights of animals were comparable (326.64, 326.34g respectively for *P. maximum* and *P. purpureum*) for both grasses. Total gains and average daily gains were significantly higher (117.501 and 145.20, 3.36 and 4.15g respectively for the total gains totals and average daily gains of *P. maximum* and *P. purpureum*) with *P. purpureum* in males and regardless to the sex during post-weaning growth. The average weights of the classical carcass (178.33 and 178.80g respectively for *P. maximum* and *P. purpureum*), and that of the commercial carcass (116.33 and 106.40g for *P. maximum* and *P. purpureum* respectively) were comparable. Commercial carcass yield has been statistically higher with *P. maximum* (40.62 and 35.10% for *P. maximum* and *P. purpureum* respectively). According to these results, *P. purpureum* seems to be better suited during the post-weaning growth in guinea pigs.

Keywords: *Cavia porcellus*; Growth Performance; *Panicum maximum; Pennisetum purpureum*

Introduction

Caviaculture has the characteristics of an economically profitable mini-farm and can there for effectively deal with protein malnutrition in Africa in general and in Cameroon in particular [1,2]. However, this mini breeding very prolific, easily manageable and inexpensive knows a low production and productivity in Cameroon due to a diet essentially based on cooked residues. Food plays a role of choice in breeding in general and caviaculture in particular Appropriates food and their well management will improve guinea pig production [3]. However, the guinea pig is a monogastric herbivore in which the fibers are essential [4]. These fibers are provided by forages including grasses like *Panicum maximum* and *Pennisetum purpureum* which are by their availability, their palatability, their value and the absence of antinutritional factors, the two most commonly used in animal feeding in general and guinea pig food in particular [5]. Better integration of these two grasses despite their current use remains a challenge for the breeder [6]. Hence the need to evaluate the forage potential of *Panicum maximum* and *Pennisetum purpureum* in caviaculture.

Methods

The study was conducted between December 2016 and May 2017 at the Research and Application Farm (FAR) of the University of Dschang, Located in the Western Highlands of Cameroon at an altitude of 1420m, at the east longitude of 09° 85' 10° 06' and at the northern latitude from 5° 36' to 5° 44'. This region receives 1500 to 2000mm of water per year with an average temperature of 18°C between July-August and 25°C between February-March. Its relative humidity varies from 40 to 97% with an insolation of 1800 hours. The climate is equatorial of the Cameroonian type altitude with a long rainy season from mid-November to mid-March and a

short dry season from mid-March to mid-November.

24 weaned (3 weeks after birth) guinea pigs of comparable weight were divided into two homogeneous lots of 12 (5 females and 7 males) animals each. The animals were raised in two boxes made of plywood (1m long, 0.8m wide and 0.6m high) each equipped with lighting and electric heating equipped with 2 feeders in wood for the concentrated feed and two concrete water troughs in one of the livestock buildings made at the Research and Application Farm of University of Dschang. Animals were raised on the ground, on a litter of 5cm thick made up of untreated dry wood chips. The litter was renewed every 2 days to avoid accumulation of feces and urine. The different lodges were equipped with a cover of small mesh to protect animals from mice and other predators that may accidentally enter the livestock building.

The plant material was *Panicum maximum* and *Pennisetum purpureum* grasses harvested at the pre-bloom stage on the FAR farm, pre-faded before being directly serve to animals. A sample of 100 g of each forages as well as the food concentrate (Table 1) was collected dried at 60°C to constant weight in a ventilated oven of mark Gallemkamp. The samples were subsequently crushed to 1 mm mesh and kept in plastic bags for different bromatological analyzes (Table 2).

Chemical composition	Dry matter (%)	Organic matter (%DM)	Crude protein (%DM)	Lipids (%DM)	Crude Fibre (%DM)	Ashes (%DM)
Panicum maximum	91.76	85.88	13.45	2.67	33.08	14.12
Pennisetum purpureum	94.83	85.98	14.84	2.96	34.78	14.02

Table 1: Chemical composition of forages used in the trial.

Ingredients	Quantities
Remolding	31
Maize	30
Cotton seed cake	5
Palm kernel cake	25
Soybean meal	2
Fish meal	3
Shell Powder	2
Premix*	1
Cooking salt	1
TOTAL	**1OO**
Valeur nutritive	
Dry matter (DM in %)	91.97
Organic matter (% DM)	89.83
Crude protein (% DM)	15.76
Lipids (% DM)	08.74
Crude Fibre (%DM)	17.48
Ashes (%DM)	10.17
ME (Kcal /Kg DM)	2576.5

Table 2: percentage and chemical composition of the concentrate food.

At weaning, females were removed from the boxes. The young were sexed and followed up to 8 weeks of age. Each animal was identified by a numbered metal buckle carried on his ear. The animals of each lodge received each day between 8am and 9am Ad libitum the grass and 20g of a compound food which was composed using ingredients purchased from dealers of agricultural byproducts of the city of Dschang (*Pennisetum purpureum Ad libitum* + 20g compound food / animal / day*; Panicum maximum Ad libitum* + 20g compound food / animal / day). Vitamin C was dissolved in drinking water and served with it (at 240 mg in 1.5 liters of water). At the end of the test, 5 animals were randomly selected in each lodge, fasted for 12h, slaughtered by cervical dislocation and bleed totally in the throat and eviscerated for the evaluation of carcass characteristics and the proportion of some organs of the digestive tract.

Collection of Data

Every morning, leftover was collected and weighing and animal droppings were cleaned before any new food distribution. Animal weighing were done weekly until the 8th week. This made it possible to determine the post-weaning weight evolution.

They following parameters were then determined:

- The weight of the classic carcass (PCl = Live weight at slaughter + Weight (blood + head + legs + viscera).
- Commercial carcass (PCco = live weight at slaughter - weight (blood + head + legs + viscera).
- The weight of liver, intestine and cecum were determined as follows:
- Weight of organ or part = 100 (weight of organ or part / live weight at slaughter).
- All weighing was carried out using a digital scale of 7kg of capacity and sensibility of 1g.

For reproduction, the following parameters were evaluated.

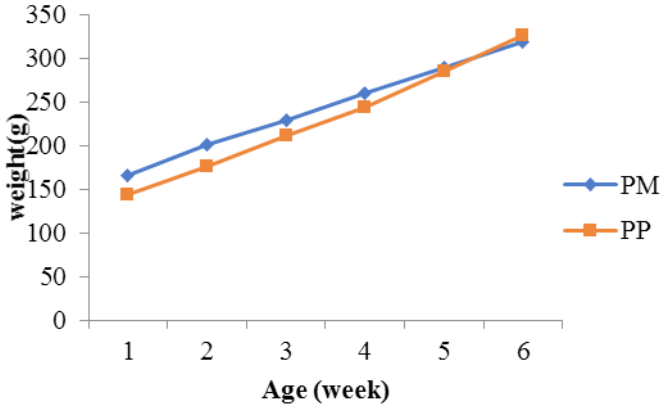
Statistical Analyzes

Data on growth performance and carcass characteristics were tested using Student test at 5% significant level and SPSS 19.0 software was used.

Results

Comparative Effect of *Panicum Maximum* or *Pennisetum Purpureum* on the Evolution Of Post-Weaning Guinea Pigs Weight

The average weight has progressively increased regardless to the grass use with time (Figure 1). Hence, no significant difference (P > 0, 05) was observed between the weight of post-weaning pigs feed with *P. maximum* and those feed with *Pennisetum purpureum.*

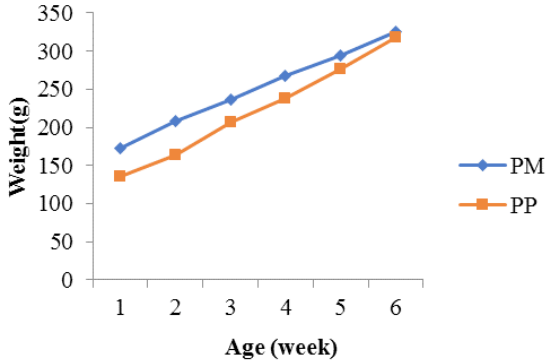


PM: *Panicum maximum*, PP: *Pennisetum purpureum***.**

Figure1: Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on the evolution of post-weaning guinea pigs weight.

Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on the weight evolution of post-weaning female's pigs

The weight of post-weaning females progressively increased regardless to the grass use with time (Figure 2). However, no significant difference (P > 0, 05) was observed between weights of post-weaning guinea pigs fed with *P. maximum* and those fed with *Pennisetum purpureum* during the period.



PM: *Panicum maximum*, PP: *Pennisetum purpureum***.**

Figure 2: Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on the growth evolution of post-weaning female's pigs.

Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on weight evolution of post-weaning young males

The weight of post-weaning males increased regardless to the grass use (Figure 3). However, no significant difference (P> 0.05) was observed between weight of males fed with *P. maximum*, and males fed with *Pennisetum purpureum* during this period.

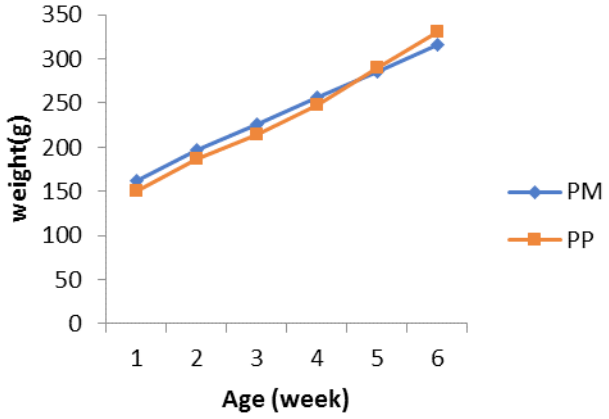


Figure3: Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on weight evolution of post-weaning young males.

Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on total gains and average daily gains of young post-weaned guinea pigs

Weaning weights were significantly (P <0.05) higher in females and regardless of the sex when animals were fed with *P. maximum* (Table 3). At 8 weeks, no significant differences (P> 0.05) were observed between body weights of animals whatever the sex and the grass used. Although comparable in females, total gains and ADGs was significantly (P 0.05) higher in males and regardless of the sex with *Pennisetum purpureum*.

Characteristic	Sex	Treatments		SEM	P
		Panicum maximum	*Pennisetum purpureum*		
Weaning weight (g)	♂	$168.40^{a}_{(7)}$	$150.64^{a}_{(5)}$	5.30	0.10
	♀	$182.00^{a}_{(5)}$	$139.57^{b}_{(6)}$	10.67	0.02
	♂♀	$175.20^{a}_{(12)}$	$145.11^{b}_{(11)}$	6.42	0.04
Weight at 8 week (g)	♂	$320.60^{a}_{(7)}$	$330.16^{a}_{(5)}$	4.32	0.39
	♀	$332.67^{a}_{(5)}$	$322.55^{a}_{(6)}$	12.67	0.73
	♂♀	$326.64^{a}_{(12)}$	$326.36^{a}_{(11)}$	7.32	0.63
Total gains (g)	♂	$118.00^{a}_{(7)}$	$144.73^{b}_{(5)}$	3.21	0.001
	♀	$117.00^{a}_{(5)}$	$145.67^{a}_{(6)}$	9.67	0.07
	♂♀	$117.50^{a}_{(12)}$	$145.20^{b}_{(11)}$	5.22	0.001
ADGs **(g/day)**	♂	$3.37^{a}_{(7)}$	$4.14^{b}_{(5)}$	0.91	0.001
	♀	$3.34^{a}_{(5)}$	$4.16^{a}_{(6)}$	0.60	0.10
	♂♀	$3.36^{a}_{(12)}$	$4.15^{b}_{(11)}$	0.40	0.001

a, b: Averages with the same letters on the same line are not significantly different at the 5% threshold; **ADG:** Average daily gain; **SEM:** Standard error on average; **P:** Probability.

Table 3: Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on Total gains and average daily gains of young post-weaned guinea pigs.

Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on carcass characteristics of guinea pigs.

Weights (live, heart, digestive tract, carcass and carcass) classic) were comparable (P> 0.05) between animals fed on *P. maximum* or *Pennisetum purpureum* (Table 4). On the other hand, the weight of the head of guinea pigs fed on *Pennisetum purpureum* were significantly (P <0.05) higher than that of guinea pigs fed with *P. maximum*. Apart from the weight of the classic carcass which was higher with *Pennisetum purpureum*, the other characteristics had higher values in guinea pigs fed with *P. maximum* although no significant difference (P> 0.05) was observed between the two grasses. The proportion of the head and the digestive tract compared to live weight were comparable (P> 0.05) for both forage. The alimentation with *Pennisetum purpureum* gave liver proportions in relation to body weight significantly (P< 0.05) higher.

Characteristic	Treatments		ESM	P
	Panicum maximum	*Pennisetum purpureum*		
weight (g)				
LW_S	291.4^{a}	302.6^{a}	20.62	0.32
Head	42.00^{a}	48.20^{b}	1.59	0.04

Heart	1.00[a]	1.60[a]	0.50	0.11
Digestif tract	84.67[a]	94.20[a]	2.51	0.09
Commercial carcass	116.33[a]	106.40[a]	10.36	0.38
Classic carcass	178.33[a]	178.80[a]	12.54	0.97
Yield (%)				
Commercial carcass	40.62[a]	35.10[b]	1.41	0.03
Classic carcass	62.46[a]	59.03[a]	1.42	0.08
Proportion of organs (%)				
Head / LW_S	14.78[a]	15.91[a]	0.39	0.14
Liver / LW_S	2.11[a]	3.37[b]	0.14	0.03
digestif tract / LW_S	29.32[a]	31.12[a]	0.24	0.08

a, b: Averages with the same letters on the same line are not significantly different at the 5% threshold; **SEM:** Standard Error on the Average; **P:** Probability, **LWS:** Live weight at slaughter.

Table 4: Comparative effect of *Panicum maximum* or *Pennisetum purpureum* on carcass characteristics of guinea pigs.

Weight and length of some digestive organs in guinea pigs fed with *Panicum maximum* or *Pennisetum purpureum*

Liver weight, large intestine length, and small intestine density were significantly ($P \leq 0.05$) higher in animals fed with *Pennisetum purpureum* (Table 5). On the other hand, no significant difference ($P > 0.05$) was observed between weight of the large intestine, small intestine and caecum of animals fed with *P. maximum* or *Pennisetum purpureum*. The large intestine was significantly (P 0.05) longer in animals fed with *Pennisetum purpureum*. While, the lengths of the small intestine and caecum were comparable ($P > 0.05$) between the two grasses.

Characteristic	Treatments		SEM	P
	Panicum maximum	*Pennisetum purpureum*		
Weight (g)				
Liver	6.00[b]	10.20[a]	0.37	0.02
Large intestine	49.33[a]	49.40[a]	3.52	0.42
Small intestine	11.00[a]	13.20[a]	1.20	0.27
Cæcum	33.66[a]	38.40[a]	1.24	0.38
Length (cm)				
Large intestine	92.16[b]	102.70[a]	2.58	0.02
Small intestine	134.50[a]	130.00[a]	2.42	0.57
Cæcum	11.00[a]	11.60[a]	0.40	0.41
Density (g/cm)				
Small intestine	0.08[b]	0.10[a]	0.01	0.02

a, b: Averages with the same letters on the same line are not significantly different at the 5% threshold; **SEM:** Standard Error on the Average; **P:** Probability.

Table 5: Weights and lengths of some digestive organs in guinea pigs fed *Panicum maximum* or *Pennisetum purpureum*.

Discussion

The average weight of animals at 8 weeks was comparable between the two grasses. This shows that animals have valued *Panicum maximum* as well as *Pennisetum purpureum*. Indeed, after weaning, the piglets would have acquired a greater capacity to value any kind of forage with regard to their herbivorous diet. This would have favored a digestion of the grass regardless of the type of forage. In fact, [7] more the animal is getting older the more it has the ability to better value the cellulose contained in the feed. The highest average weight 332.67g obtained with *Panicum maximum* in females and 330.16g registered in males fed with *Pennisetum purpureum* is less than 342.42g for *P. purpureum* and 337.67g for *P. maximum* obtained in young animals supplemented with a ration containing *Arachis glabrata* [8]. This weight is greater than 214 g and 216 g observed respectively with 16% and 18% of protein at the 8-week-old guinea pig [9]. This difference can be explained by the form of presentation of the grass. Indeed, in these last authors, *Pennisetum purpureum* had been dried, crushed and incorporated into the other ingredients while in this study the animals receive it fresh (leaves and stems).

Weight gain and ADG of guinea pigs receiving *Pennisetum purpureum* were significantly higher than those of animals fed with *Panicum maximum* at 8 weeks of age regardless of the sex. This can be explained by the chemical composition of *Pennisetum purpureum* whose was better compared to that of *Panicum maximum*. *Pennisetum purpureum* would therefore be better suited for meeting the needs of animals after weaning. Our value obtained in this study (4.16 g) is less than 4.94 g obtained by [8] in guinea pigs supplemented with *Arachis glabrata*. This will be explained by the low protein content of our rations. Comparative effect of *P. purpureum* or *P. maximum* on guinea pig weights at slaughter and carcass yields according to live weight of animals at slaughter were comparable for both grasses. However, the highest weight (302.6g) was recorded with *P. purpureum*. This observation justifies the high bromatological value of *P. purpureum* compared to *P. maximum*. This observation is similar to that of [8] in guinea pigs supplemented with different sources of legumes.

The carcass weights while being comparable for both grasses were higher (116.33g) with *P.maximum* for the commercial carcass and (178.80 g) with *P. purpureum* for the conventional carcass. The highest live weight (302.6g) obtained in this study is lower than that of the animals fed with diets containing *D. intortum* (408.40g for *P. purpureum* and, 426.60g for *P. maximum*) obtained by [8] but remains above 221 ± 11g recorded by [9] with 16% protein ration. This difference can be explained by the fact that our grass was served fresh. The highest carcass weight (116.33g for the conventional carcass and 178.80g for the commercial carcass) obtained in this study is greater than 99.3 ± 3.3g observed by [9] in male guinea pigs fed with a 16% protein ration. It is, however, less than 202.6 to 246.0g obtained by [10] in hybrids from the cross between male and female *Bukavu*. This would be due to the genetic difference with the animals used in the context of this study. *P. maximum* gave better carcass yield regardless of the type of carcass.

The highest carcass yield (47.68% for *P. purpureum* and 49.28% for *P. maximum*) obtained in the animals submitted to the diets containing *D. intortum* [8] are higher than 35.10% for *P. purpureum* and 40.62% for *P. maximum* obtained in this study. Our numbers are also lower than the 43.5 ± 1.7% and.9% respectively obtained [9] with male guinea pigs fed with a 16% protein diet and [10] in hybrids from the cross between male and female *Bukavu*. This would be due to the difference in protein level and the low genetic potential of our animals. Compared effect of *P. purpureum* or *P. maximum* on some organs involved in digestion in the guinea pig. The weight of the liver, the length of the large intestine and the density of the intestine were significantly higher with *P. purpureum*. This difference would be related to the bromatological value of this grass indeed according to Atuahéné *et al*. (1986), the weight of the 5th neighborhood increases with the level of fiber in the food.

Animals fed with *P. purpureum* had the highest ceacal weight (38.40g). This could be due to the high cellulose content of *P. purpureum* (34.78g / MS against 33.08g / MS in *P. maximum*) used in this study. Our results are in agreement with those of [8] who noted in guinea-pigs supplemented with legumes the highest caecum weight compared to the control batch. Similarly, the values (32.9 ± 1.7g, 29.2 ± 2.3g and 26.3 ± 2.5g) recorded [9] respectively with 14, 16 and 18% protein show that the weight of cecum drops with increasing protein level or lower fiber level food ration. Thus, guinea pigs fed with *P. purpureum* would have ingested more fiber which would have promoted the development of organs involved in digestion. In fact, in guinea pigs, as in most pseudo-ruminants, caecum is the organ strongly involved in the digestion of cellulose because it houses the microbial flora able to digest cellulose. Thus, the more the food is fibrous, the more microorganisms are solicited and reciprocally the development of the cecum follows. The cecum is indeed [11], the rumen equivalent in ruminants.

Conclusion

This study shows that:

- The weight of guinea pigs at 8th week was comparable for both grasses;
- *Pennisetum purpureum* gave better weight gains from weaning to 8th week of age;
- *Panicum maximum* gave better carcass yields and low organ weights compared to *Pennisetum purpureum*.

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