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Effect of *Arachis glabrata* Levels in the Diet on Reproduction and Pre-Weaning Growth Performance of Guinea Pigs (*Cavia porcellus* L) Fed on *Panicum maximum*

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Abstract: In order to evaluate the level of inclusion of *Arachis glabrata* in the diet of Guinea pig (*Cavia porcellus* L.) fed to *Panicum maximum* on the reproduction and pre-weaning growth performance, trials were conducted at the Laboratory of Animal Production and Nutrition (LAPRONAN) (FASA) of the University of Dschang between December 2016 and April 2017. For this purpose, 56 adult guinea pigs of local breed including 48 females and 8 males all 5 months old about and weighing on average 400 ± 50g were used. These animals were randomly distributed into 4 homogeneous lots of 12 animals and crossed with a ratio of 2 males for 12 females in a factorial design. Animals were submitted to iso-nitrogen rations (17% protein) associated with *P. maximum*. The animals in the control group received *P. maximum* at will and one concentrated food not containing *Arachis glabrata* (PMA0), while those of the other lots received in addition to *P. maximum* a concentrated food containing respectively 10 (PMA10), 15 (PMA15) and 20% of *Arachis glabrata* (PMA20). The results of this study show that the inclusion of the increasing level of *Arachis glabrata* had no significant effect (P> 0.05) on litter size. The rate of stillbirth was 9.10% in the animals receiving the ration containing 20% of *Arachis glabrata* compared to 0% for the other diets. The highest pre- and post-weaning mortality rates (30 and 33.33%, respectively) were recorded in animals receiving 20% and 10% rations of *Arachis glabrata*, respectively. The ration containing 10% of *Arachis glabrata* yielded the best fertility (75%), and net fertility (108.33%). Inclusion of 20% of *Arachis glabrata* in the diet resulted in the highest mean weights (P <0.05) in lactating females from birth to weaning. At birth and weaning, the highest average weight of piglets was obtained in control batch of animals. In terms of total gain (TG) and average daily gain (ADG), the ration containing 20% of *Arachis glabrata* recorded the most significant (P <0.05) values (105.36g and 5.20g / d respectively) at weaning. Thus, *Arachis glabrata* can be included up to 20% in the ration as a source of protein for improving production performances of guinea pigs in a farm environment.

Keywords: *Panicum Maxim*um, Guinea Pigs, Ingestion, Reproduction, Growth Performance

1. Introduction

Food security in general and protein in particular is a challenge in most African regions and Cameroon in particular [1]. In fact, the imbalance observed between population growth and the supply of animal protein leads to an increase in malnutrition in most low-income families [2-5]. To combat this scourge, the development of the production of unconventional species in which the guinea pig is one of the part is the best opportunities to seize [2, 3]. Its optimal use as a source of protein and income therefore requires an increase in its production and productivity, which necessarily involves improving breeding strategies on the one hand, and better rational methods of managing the production of feed on the other hand [6]. However, food is still one of the main handicaps to the development of caviaculture (breeding of guinea pigs) in Africa in general and in Cameroon in particular. However, in Cameroon, several plant species have a certain forage potential but not yet explored in caviaculture [5]. Even in species that can rely mainly on marginal forages, it has been shown that protein supplementation could double or triple their productivity [7].

Several solutions have been considered. One of the most feasible alternatives is the use of high-protein forages that have a nutritional value as a supplement to poor foods [8, 9]. Such forages can be used to increase the ingestion and digestion of tropical grasses that are low in protein [10].

Among nitrogen-rich plants, *Arachis glabrata* is interesting because of its ease of cultivation in Cameroon, and its use can also be an effective solution in reducing the cost and increasing the production performance of domestic herbivores in general and Guinea pig production in particular. However, although it has positive effects on production performance, its level of inclusion in the guinea pig diet has not yet received any real attention from researchers. The objective of this work is therefore to determine the effects of different levels of *Arachis glabrata* in guinea pig feeding on reproduction and pre-weaning growth performances.

2. Material and Methods

2.1. Experimental Site

The study was conducted between December 2016 and April 2017 at the Laboratory of Animal Production and Nutrition (LAPRONAN) (FAAS) of the University of Dschang, located in the western highlands of Cameroon at an altitude of 1420 m, at the east longitude of 09 ° 85'- 10 ° 06 'and the north latitude of 05 ° 36'- 5 ° 44'. The climate of the locality is an altitude equatorial Cameroonian-type with a short dry season from mid-November to mid-March and a long rainy season from mid-March to mid-November.° This region receives between 1500 and 2000 mm of rain per year, with a temperature ranging from 10 to 25°C.

2.2. Animal Material and Housing

Fifty six (56) adult guinea pigs weighing an average of 400 ± 50 g consisting of 48 females and 8 males of 5 months old were used for this test. These animals were distributed randomly in four lots of 12 females and 2 males each, they were distributed in boxes measuring 1.25 m in length, 0.60 m in width and 0.30 m in height each, delimited by plywood and provided with a lighting and heating device. They were raised on the ground, on a litter made of untreated dry wood chips of about 5 cm thick, renewed every 2 days to avoid the accumulation of feces and urine. Each lodge was equipped with a wooden feeder for the concentrated feed and two concrete waterers.

2.3. Plant Material

Panicum maximum grass was cut in the fodder plot of the Faculty of Agronomy and Agricultural Sciences the day before, kept in one of the logis of the livestock building and, pre-washed before being served the next day to the animals. Leaves of the legume *Arachis glabrata* were harvested before flowering, dried, crushed and incorporated into feed. A 100 g sample of each plant and food was dried at 60 ° C in an oven until a constant weight was obtained, milled and stored in plastic bags for chemical composition analysis [11].

2.4. Conduct of the Test

2.4.1. Manufacture of Different Rations

Proportions of different ingredients purchased from the agricultural by-products resellers in the city of Dschang for the concentrate formulation are presented in Table 1.

The experimental rations were constituted as follows:

a) PMA0: *Panicum maximum ad libitum* + 40g of concentrate + 0% of *A. glabrata* / animal / d
b) PMA10: *Panicum maximum ad libitum* + 40g of concentrate + 10% of *A. glabrata* / animal / d
c) PMA15: *Panicum maximum ad libitum* + 40g of concentrate + 15% of *A. glabrata* / animal / d
d) PMA20: *Panicum maximum ad libitum* + 40g of concentrate + 20% of *A. glabrata* / animal / d

A 100 g sample of different diets was dried at 60 ° C in an oven until a constant weight, milled and kept in plastic bags for the evaluation of chemical composition according to the method described by A. O. A. C [11].

2.4.2. Reproductive Performance

For the assessment of reproductive performance, at the beginning of the test, the number of females put in reproduction was recorded as well as their weights. During gestation, the number of females with abortions was noted. The number of calving females and the calving date were subsequently recorded. At birth, the number of stillborn and live-born piglets was recorded. Then, the number of dead animal before weaning and the number of weaned pups were also recorded. In addition, after calving, mothers and piglets were weighed every 7 days until pups were weaned.

2.4.3. Growth Performance

Regarding the assessment of growth performances, the refusals of different rations were collected every morning and weighed using a digital balance of 7 kg capacity and sensitivity 1 g. For the assessment of weight gain, mothers' weights were taken at birth, then every 7 days until weaning (21 days). Pups were also weighed at birth and weekly up to 3 weeks of age.

2.5. Statistical Analysis

Reproductive characteristics of suckling females and juvenile growth data were subjected to one-way analysis of variance (inclusion level of *A. glabrata*) following the general linear model (GLM). Body weight and weight gain data were subjected to two-way analysis of variance (Treatment and sex or birth type). When the differences were significant between treatments, the means were separated by the Duncan test at the 5% threshold [12] and the Student's "t" test was used to compare the sexes.

Table 1. *Formulation and chemical composition of different forages and iso nitrogen rations used.*

Ingredients (%)	Different rations				Fillings	
	PMA0	PMA10	PMA15	PMA20	P. maximum	A. glabrata
Remoulding	31	27.5	26.5	25	-	-
Corn	30	27	25.5	24	-	-
Cotton seed cake	5	4.5	4	4	-	-
Palm kernel cake	25	22.5	21	20	-	-
Soybean meal	2	2	2	1.5	-	-
Fishmeal	3	2.5	2.5	2.5	-	-
Shell meal	2	2	1.5	1.5	-	-
Premix (1%)	1	1	1	1	-	-
Cooking salt	1	1	1	1	-	-
Arachis glabrata	0	10	15	20	-	-
TOTAL	100	100	100	100	-	-
Chemical composition						
Dry matter (%)	97.82	97.28	97.68	97.54	91.76	95.29
Organic matter (% DM)	86.06	87.76	88.44	87.45	85.88	87.82
Crude protein (% DM)	16.79	16.83	16.85	17.05	13.45	19.53
Crude fiber (% DM)	15.80	17.93	17.80	17.46	33.08	20.94
Ash (% DM)	13.94	12.24	11.56	12.55	14.12	12.18

MS: dry matter; PMA20: *Panicum maximum* + concentrate containing *A. glabrata* 20%; PMA15: *Panicum maximum* + concentrate containing *A. glabrata* 15% ; PMA0: *Panicum maximum* + concentrate without legume; PMA10: *Panicum maximum* + concentrate containing *A. glabrata* 10%.

3. Results

3.1. Effect of the Inclusion Level of A. Glabrata in the Ration on Reproductive Performance

The fertility rate varied with rations. Indeed, the ration containing 10% of *A. glabrata* (PMA10) yielded the highest rate (75%) and the ration containing 20% *A. glabrata* (PMA20) the lowest rate (58.33%) (Table 2).

The sizes of the litter remained comparable and were 1.38; 1.44; 1.38 and 1.57 respectively for the animals of the PMA0 batches; PMA10; PMA15 and PMA20. The highest value was recorded in females of lot PMA20.

The highest fertility and net fertility rate (108.33) was obtained with animals receiving 10% *A. glabrata* in the ration, the others remained comparable. With respect to viability at birth and weaning, the lowest values (90.90% and 70%, respectively) were obtained in the PMA20 lot and highest with the other treatments.

3.2. Effect of the Inclusion Level of A. Glabrata in Ration on Food Intake of Females During Gestation

The inclusion of the increasing rate of *Arachis glabrata* had no significant effect (P> 0.05) on *P. maximum* intake but, significantly (P <0.05) affected ingestion of the compound food.

The inclusion of 20% of *Arachis glabrata* in the compound feed significantly improved (P <0.05) ingestion of DM. Similarly, ingestion of OM, CP, and CF with the 20% *Arachis glabrata*-containing feed was significantly (P <0.05) higher than that of the compound feed containing 15% of *Arachis glabrata.* The inclusion of 20% of *Arachis glabrata* in the diet significantly improved (P <0.05) the intake of total DM, total OM, and total CP compared to the ration containing 15% of *Arachis glabrata.*

3.3. Effect of the Inclusion Level of A. Glabrata in the Diet on Postpartum Weight Gain of Females During Lactation

During trial, the weekly average weight of all lactating females declined for the first week regardless of the inclusion level of *A. glabrata* in the ration (Figure 1). This decline continues in week 2 among those receiving 0 and 15% of *A. glabrata* and at the 3rd week in those receiving 0, 10 and 15% of *A. glabrata*. In addition, there was a slight increase in average weight in the 2nd week among those receiving 15 and 20% of *A. glabrata* and at the 3rd week only in those receiving 20% of *A. glabrata.*

3.4. Effects of the Level of Arachis glabrata on the Weekly Weight Change of Piglets from Birth to Weaning

The weight of piglets has increased over time regardless of the treatment considered (Figure 2). At birth, animals in the control group had the highest (P <0.05) mean weights (78.36) while those in the 10% *Arachis glabrata* diet presented the lowest one (67.75). In contrast, weaning mean weight in the batch receiving the 20% *Arachis glabrata* diet was significantly (P <0.05) higher (182.54g) than those of other batches.

3.5. Effect of the Level of Arachis glabrata on the Weekly Weight Change of Male Piglets from Birth to Weaning

Male weights increased during the trial with age, regardless of treatment (Figure 3).

Indeed, the weight of animals receiving 20% of *Arachis glabrata* in the diet has increased steadily from birth to weaning. The highest mean weights from birth to weaning were obtained with animals receiving 20% of *Arachis glabrata* and the lowest with animals receiving 10% of *Arachis glabrata* in the diet. In addition, mean weights of animals receiving 0 and 15% of *Arachis glabrata* were comparable (P> 0.05) during this same period.

3.6. Effect of Arachis glabrata Level in the Diet on the Weekly Weight Change of Female Piglets from Birth to Weaning

The animals weight increased from birth to weaning whatever the ration considered (Figure 4). The inclusion of *Arachis glabrata* in the diet had no significant influence (P> 0.05) on animal weights from birth to week 2. During the last week, the average weight of animals in the batch receiving 20% of *Arachis glabrata* in the diet was significantly (P <0.05) higher than those of other diets.

3.7. Effect of the Level of Arachis Glabrata on Weight Gains and Average Daily Gains of Piglets from Birth to Weaning

The addition of *Arachis glabrata* to the diet had no significant effect (P> 0.05) on weight of piglets at birth. At weaning, the ration containing 20% of *Arachis glabrata* in the diet had the highest weight (P <0.05) in both males and females and regardless of sex. The PM10 ration showed the lowest values (Table 4).

On the other hand, in terms of total gains and average daily gains, animals receiving 20% of *Arachis glabrata* in the diet showed significantly (P <0.05) higher values in males, females, or regardless of sex. Those receiving 10% of *Arachis glabrata* in the diet presented the lowest rate.

3.8. Effect of the Level of Arachis glabrata in the Diet on Weight Gains and Average Daily Gains of Piglets from Birth to Weaning According to the Type of Birth (Single or Double)

Whatever the age and ration considered, animals from single births were heavier than those from double births (Table 5). At birth, the inclusion of the powder of the leaves of *Arachis glabrata* in the diet significantly (P <0.05) influenced the weight of the piglets at both birth and weaning. The same was true for GTs and ADGs based on birth types.

Animals receiving 20% of *Arachis glabrata* had significantly higher (P <0.05) values for all characteristics, except for the birth weight where the control group give the highest value for double birth. Similarly, animals receiving the ration with 10% *Arachis glabrata* presented the lowest weaning weights, TG and ADG regardless of birth type. At birth, the lowest weight was obtained with animals receiving 10 and 15% of *Arachis glabrata* respectively for single and double births.

Table 2. *Mean reproductive performance in guinea pigs as a function of different rations.*

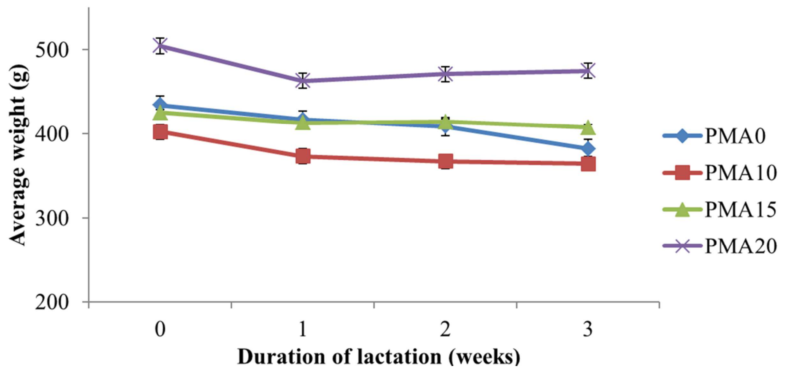
Characteristics	Treatments			
	PMA0	PMA10	PMA15	PMA20
Fertility rate (%)	66.66	75	66.66	58.33
Range size *	1.38[a]	1.44[a]	1.38[a]	1.57[a]
Fertility rate (%)	91.67	108.33	91.67	91.67
Net fertility rate (%)	91.67	108.33	91.67	83.33
Viability at birth (%)	100	100	100	90.90
Viability at weaning (%)	100	92.30	100	70

[a]: Averages with the same lowercase letters on the same line are statistically identical. PMA20: *Panicum maximum* + concentrate containing *A. glabrata* 20%; PMA15: *Panicum maximum* + concentrate containing *A. glabrata* 15% ; PMA0: *Panicum maximum* + concentrate without legume; PMA10: *Panicum maximum* + concentrate containing *A. glabrata* 10%.

Table 3. *Food intake of guinea pigs during pregnancy according to the different diets.*

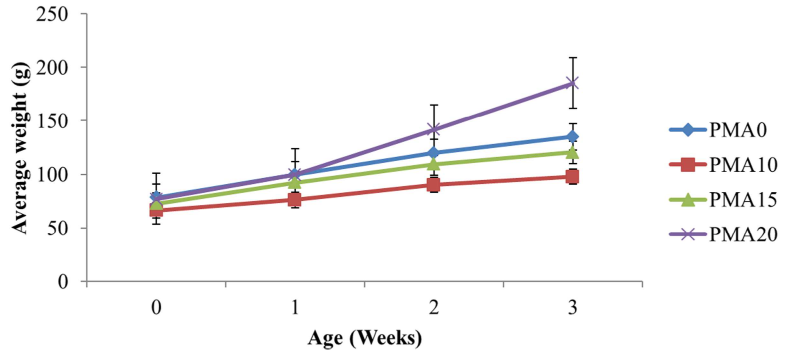
Ingestions (MS / j / animal)	Treatments				SEM	P
	PMA0	PMA10	PMA15	PMA20		
Dry matter						
P. maximum	46.47[a]	45.96[a]	46.13[a]	47.46[a]	1.17	0.861
Concentrate feed	31.66[bc]	32.53[ab]	30.00[c]	34.15[a]	0.81	0.007
Total dry matter	78.14[ab]	78.49[ab]	76.13[b]	81.61[a]	1.11	0.050
Organic matter						
P. maximum	39.91[a]	39.47[a]	39.61[a]	40.76[a]	0.56	0.861
Concentrate feed	27.25[b]	28.55[ab]	26.54[b]	29.87[a]	0.39	0.009
Total OM	67.16[ab]	68.02[ab]	66.15[b]	70.62[a]	0.95	0.010
Crude protein						
P. maximum	06.25[a]	06.18[a]	06.20[a]	06.38[a]	0.87	0.861
Concentrate feed	05.07[a]	05.34[a]	04.67[b]	05.35[a]	0.75	0.001
Total CP	11.32[ab]	11.53[a]	10.87[b]	11.73[a]	0.16	0.040
Crude fiber						
P. maximum	15.37[a]	15.20[a]	15.26[a]	15.70[a]	0.22	0.861
Concentrate feed	05.00[b]	05.83[a]	05.34[b]	05.96[a]	0.90	0.000
Total CF	20.38[a]	21.04[a]	20.60[a]	21.66[a]	0.353	0.216

[a, b, c]: Averages with the same letters on the same line are not significantly different at the 5% level; PMA20: *Panicum maximum* + concentrate containing *A. glabrata* 20%; PMA15: *Panicum maximum* + concentrate containing *A. glabrata* 15%; SEM: Standard Error on Mean; P: Probability; DM: Dry matter; OM: Organic matter; CP: Crude Protein; CF: Crude Fiber; PMA0: *Panicum maximum* + concentrate without legume; PMA10: *Panicum maximum* + concentrate containing *A. glabrata* 10%.



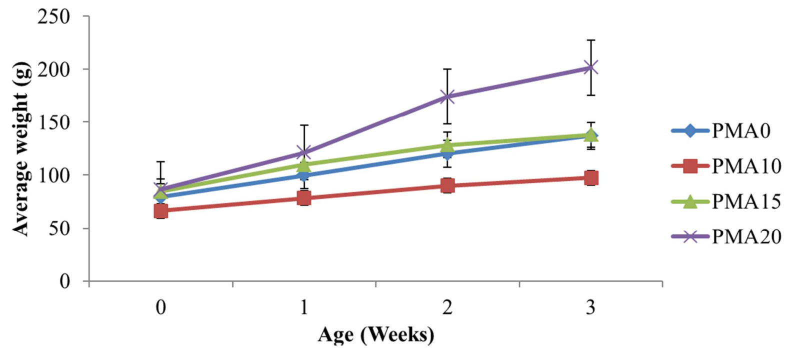
PMA: Panicum maximum+ concentrate containing Arachis glabrata; 0, 10, 15 and 20: inclusion rate of the legume.

Figure 1. *Evolution of mean weight of suckling females during pre-weaning phase, based on food rations.*



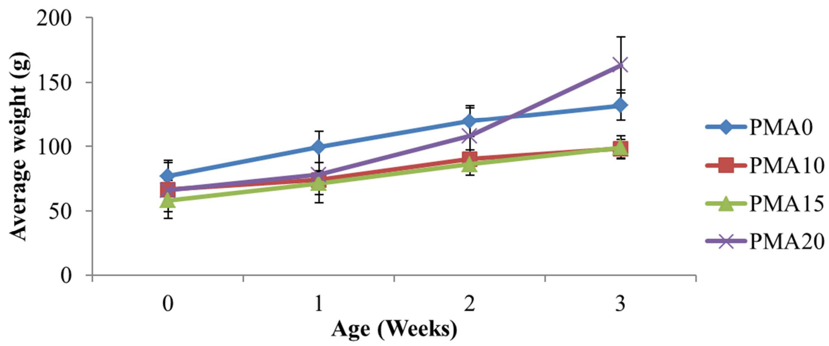
PMA: Panicum maximum+ concentrate containing Arachis glabrata; 0, 10, 15 and 20: inclusion rate of the legume.

Figure 2. *Evolution of weight of piglets from birth to weaning, by diet.*



PMA: Panicum maximum+ concentrate containing Arachis glabrata; 0, 10, 15 and 20: inclusion rate of the legume.

Figure 3. *Weight evolution in male piglets from birth to weaning in function rations.*



PMA: Panicum maximum+ concentrate containing Arachis glabrata; 0, 10, 15 and 20: inclusion rate of the legume.

Figure 4. *Weight evolution in female piglets from birth to weaning according to different diets.*

Table 4. *Total gain and Average Daily gain of Piglets from Birth to Weaning by Food Rations.*

Characteristics	Treatments				*SEM*	P
	PMA0	PMA10	PMA15	PMA20		
birth Weight (g)						
♂	79.50^{a} (6)	66.50^{a} (6)	84.50^{a} (6)	86.50^{a} (6)	4.10	0.321
♀	77.00^{a} (5)	69.00^{ab} (7)	57.17^{b} (5)	66.00^{ab} (5)	2.80	0.001
♂♀	78.36^{a} (11)	67.75^{a} (13)	70.83^{a} (11)	77.18^{a} (11)	2.66	0.446
Weaning weight (g)						
♂	137.00^{b} (6)	98.33^{c} (6)	138.00^{b} (6)	201.75^{a} (4)	11.02	0.050
♀	132.20^{a} (5)	98.17^{b} (6)	92.20^{b} (5)	163.33^{a} (3)	10.51	0.040
♂♀	134.82^{ab} (11)	98.25^{c} (12)	118.60^{b} (11)	182.54^{a} (7)	7.78	0.024
Total gain (g)						
♂	57.50^{bc}	31.83^{c}	53.50^{bc}	115.25^{a}	5.20	0.000
♀	55.20^{b}	29.17^{c}	35.05^{bc}	97.33^{a}	4.91	0.000
♂♀	56.45^{b}	30.50^{c}	47.77^{b}	105.36^{a}	3.59	0.000
ADG (g/d)						
♂	2.74^{b}	1.52^{c}	2.55^{b}	5.49^{a}	0.25	0.000
♀	2.63^{b}	1.39^{c}	1.67^{c}	4.64^{a}	0.23	0.000
♂♀	2.69^{b}	1.45^{c}	2.28^{b}	5.02^{a}	0.17	0.000

$^{a, b, c:}$ Averages with the same letters on the same line are not significantly different at the 5% level; ADG: Average daily gain; SEM: Standard error of mean; P: Probability, (): effective size of piglets. PMA20: *Panicum maximum* + concentrate containing *A. glabrata* 20%; PMA15: *Panicum maximum* + concentrate containing *A. glabrata* 15%; PMA0: *Panicum maximum* + concentrate without legume; PMA10: *Panicum maximum* + concentrate containing *A. glabrata* 10%.

Table 5. *Birth weight, weaning weight, Total Gain and Average Daily Gain of pre-weaned young guinea pigs according to the ration and birth type (single or double).*

Characteristics	Treatments				*SEM*	P
	PMA0	PMA10	PMA15	PMA20		
Weight at birth (g)						
Simple	80.60^{ab} (5)	75.00^{b} (6)	88.00^{a} (5)	108.20^{a} (5)	3.09	0.0001
Double	76.50^{a} (6)	64.75^{ab} (7)	59.66^{b} (6)	60.00^{ab} (6)	3.07	0.0001
Weaning weight (g)						
Simple	149.80^{b} (5)	105.80^{c} (5)	146.40^{b} (5)	199.80^{a} (5)	4.50	0.0001
Double	124.20^{b} (6)	92.14^{c} (7)	98.67^{c} (6)	149.00^{a} (2)	4.39	0.0001
Total earnings (g)						
Simple	69.20^{b}	29.60^{c}	58.40^{b}	91.60^{a}	7.93	0.0001
Double	45.83^{b}	27.39^{c}	39.00^{bc}	84.00^{a}	1.80	0.0001
ADG (g/d)						
Simple	3.29^{b}	1.41^{b}	2.78^{ab}	4.36^{a}	0.377	0.0001
Double	2.18^{b}	1.30^{b}	1.86^{ab}	4.00^{a}	0.855	0.0001

$^{a, b, c:}$ Averages with the same letters on the same line are not significantly different at the 5% level; ADG: Average Daily Gain; SEM: Standard error of mean; P: Probability, (): effective size of piglets. PMA20: *Panicum maximum* + concentrate containing *A. glabrata* 20%; PMA15: *Panicum maximum* + concentrate containing *A. glabrata* 15%; PMA0: *Panicum maximum* + concentrate without legume; PMA10: *Panicum maximum* + concentrate containing *A. glabrata* 10%.

4. Discussion

4.1. Effects of the Level of Arachis glabrata on Food Intake During Pregnancy and Lactation in Guinea Pigs

The total daily intake of DM was significantly higher (81.61%) in animals supplemented with the ration containing the highest rate of *Arachis glabrata* 20%. This is similar to the observations of [4, 13, 14]. This difference could be explained by the high level of *Arachis glabrata* which, given its high protein content, would have allowed a sufficient proliferation of intestinal cellulolytic microorganisms, resulting in the rapid digestion of nutrients, thus accelerating the digestive transit; this has the effect of pushing the animal to consume more and thus allows the maximum release of the energy necessary for the coverage of needs. Indeed, according to Miégoué et al. [5], the lower the energy of ration is, the more it is ingested.

The same trend has been observed with the ingestion of DM, OM, CP and CF, which shows that associated with *P.maximum*, 20% of *Arachis glabrata* in the ration allows to obtain better ingestions. This is in agreement with the observations of Miégoué et al. [5]. The ration containing 20% of *Arachis glabrata* would therefore have provided the animal with a large quantity of essential elements that lead to good digestion of food. On the other hand, 15% of *Arachis glabrata* used in the PMA15 ration did not favor the total ingestion of the total DM, OM and CP. Indeed, similar results were obtained by Miégoué et al. [5] who obtained better DM intake when *P. maximum* was associated with the conventional protein source of the diet compared to supplementation with *Arachis glabrata*. Protein value and low antinutritional factors may therefore have had a depressive effect on food intake. The highest DM ingestion rate obtained in this trial (81.61 g DM/day/animal) with 20% of *Arachis glabrata* in the diet is higher than those reported by Miégoué et al. [5] in guinea pigs fed *P. maximum* and Kouakou et al.[13] in guinea pigs fed *P.maximum* and supplemented with cotton seed cake respectively. The observed difference could be attributed to the protein source in the ration.

4.2. Effects of the Level of Arachis Glabrata on Reproductive Performance

Reproductive performance in females receiving increasing inclusion rates of *Arachis glabrata* in the diet remained comparable to those in the control group. The highest fertility rate obtained in this study (75%) with the diet containing 10% *A. glabrata* is lower than those obtained by Mweugang et al. [15] (96%), by Noumbissi [16] (93.33%) and by Zougou et al. [17] (100%), because these authors used 22%, 19.38% and 18.43% of CP respectively in their diets, which are higher than that of the diet containing 10% of *Arachis glabrata* (17% CP). Animals receiving 20% of *Arachis glabrata* had the lowest rate (58.33%) but higher than that obtained by [15] (40%).

The highest fertility rate (108.33%) was obtained with the diet containing 10% *Arachis glabrata*. This rate is much lower than those obtained by Zougou et al. [17] (206.67%), Miégoué et al. [5] (133.33%) and Mweugang et al [15] (184%). Females receiving other diets had the lowest rate (91.67%). This is related to the number of pups they produced overall and could also be explained by the type, amount and CP content of the legumes used by these authors compared to those in this study.

Variation in the inclusion rate of *Arachis glabrata* had no significant effect on litter size. The same observation was made by different authors [15-17] and [5]. This could be explained by the farrowing rank of breeding females; indeed, these were primiparous and according to Tchoumboue et al [18] and Noumbissi [16] the litter size is related to the farrowing number of the breeders and the first litter are always weaker. The highest litter size (1.57) obtained with the ration containing 20% of *Arachis glabrata* was smaller than that obtained by Zougou et al. [17] (2.07), by Mweugang et al [15] (1.92) and by Noumbissi [16] (2.09). This could be explained by the low level of CP (17%) and the type of legume used in our rations compared to 18% of cassava leaf flour and 29.88% of CP respectively used by these authors. It was higher than that (1.33) obtained by Miégoué et al. [5]. The values obtained in this study are also related to the fact that the females used were primiparous. In fact, primiparous animals generally produce low litters size compared to multiparas [3].

Viabilities at birth were higher (100%) in females receiving 0, 10 and 15% of *Arachis glabrata* in their diet. These rates are comparable to those reported by others authors [17, 19]. This could be explained by the level of CP used by these authors and that used in our rations which remained comparable (17% on average of CP in our rations against 16.26% of CP by Miégoué [19] and 17.87 % of CP by Zougou et al. [17]). Moreover, this rate is higher than those reported by [16] (96.30%). This would be due to their very high CP level (19.38%) compared to that used in this study (17%). At weaning, these levels were obtained with the animals receiving rations containing 0 and 15% of *Arachis glabrata*. The highest rates of viability at weaning (100%) in this study are higher than those reported by the same authors. This finding can be attributed, among other things, to food and maternal qualities. Indeed, in young guinea pigs, diet is a factor of viability both at birth and weaning [18]. Birth weight is a key parameter for the survival of young guinea pigs [20].

It has been noted that viability increased with the level of protein in the diet [16, 18]. From farrowing to weaning, the average weekly weight of all lactating females declined. These results are in agreement with many observations [5, 16, 17 and 21]. Indeed, during lactation, mothers spend a lot of energy on milk production [22]; not only are their nutritional needs during lactation often difficult to cover, but they also have to go to great lengths to meet the demand of the young [23]. Nevertheless, the least weight loss was observed in lactating female receiving 20% of *Arachis glabrata*. This would be due to the higher amount of *Arachis glabrata* in the PMA20 ration compared to the others that would have contributed a quantity of protein to this ration. This is in agreement with the observations made by Zougou et al. [21]. Similarly, Kouakou et al. [2] found an increase in weight, from weaning to lactation of maximum lactation fed females supplemented with rabbit pellets, probably due to the high protein value of the foods used. In these animals, the highest reduction was obtained with the control diet; this shows that the combination between *P. maximum* and a ration containing 20% of *Arachis glabrata* can constitute a good food formula for the management of females during the postpartum period.

At birth and regardless of sex, Guinea pigs receiving different diets had average weights comparable to each other. This shows that the quality of the proteins received by the supplemented mothers had no effect on these weights. But this is contrary to the observations of Miégoué et al. [5] who found that animals receiving rations containing legumes were heavier than those in the control group, because guinea pigs are herbivores, would have better valued proteins of plant origin. In fact, the weights obtained (78.36g) with the control group in this study were lower than those obtained in guinea pigs by many authors [1, 24]. This weight is higher than those obtained by Pamo et al.[25] (73g) in guinea pigs supplemented with *Moringa oleifera*. This difference can be explained by a better valuation of the food received by the animals in this study.

At weaning, the weights of the piglets in all batches had increased and even doubled for animals receiving 20% of *Arachis glabrata*. This would be associated with the rapid pre-weaning growth characteristic of guinea pigs. The highest weight of pups fed with 20% of *Arachis glabrata* (182.54g) was comparable to that of Guinea pigs weaned at the same age by Miégoué [19] (181.88g), and more high to that obtained by Zougou et al. [21] (164.31 g). This could be explained by the type of legume and the level of CP used by these authors.

At birth apart from the ration containing 15% of *Arachis glabrata* for females and at weaning, no significant difference was observed between weights in males and females. This observation is in agreement with those obtained by Miégoué et al. [5] who reported at birth and weaning comparable weight gains between males and females. This is contrary to the results obtained by many authors in guinea pigs [1, 20, 26 and 27]. In contrast, the control (female) and 20% *Arachis glabrata* (male) diet had the highest birth weights, and treatment with 20% *Arachis glabrata* had the highest weights at weaning for both sexes. Weight in males at birth (86.50 g) was higher than those observed by [19]. This would probably be due to the quality of the proteins received by the animals of this study contrary to those of this author. At weaning, the weight of males receiving the PMA20 treatment (201.75 g) was higher than those obtained (154 g and 180.09 g) respectively by [28] and [19]. This may be due to the quality of the food in this study compared to that of same-sex guinea pigs in traditional and stationary settings by these authors respectively. The trend remained the same at weaning but contrary to birth in females.

The highest TG and ADG (115.25 g and 5.49 g / d) were obtained from piglets in the ration receiving 20% *Arachis glabrata*. This ADG is superior to those observed by many authors [1, 2, 19, 27]. It is also weak compared to the ADG obtained by some authors [2, 25]. This could be explained on the one hand by the good valorization of this legume to 20% of inclusion in the ration and on the other hand by the quantity and the quality of the supplements used by each of the authors.

5. Conclusion

This study shows that *Arachis glabrata* as an alternative source of protein in the diet achieved the best rates of fertility and pre-weaning viability at 10 and 15% inclusion, the best size was obtained with the diet containning 20% of *Arachis glabrata*. In addition, *Arachis glabrata* increased the average weight of lactating females, piglets, TG and ADG from birth to weaning with 20% inclusion in guinea pigs. In view of these results, rations containing 10 and 15% of *Arachis glabrata* are more suitable for guinea pigs during gestation and those containing 20% *Arachis glabrata* for growing (PMA20). It would also be desirable to evaluate the effect of different rations over several generations in the guinea pig to better perceive the effect of these rations on the performance of the animal.

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