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EFFECTS OF POWDERED PEANUT *(ARACHIS HYPOGEAE)* ON THE SEX REVERSING IN GUINEA FOWL AND THE PARAMETERS OF PRODUCTION AND REPRODUCTION IN THE FOWL *"NUMIDA MELEAGRIS"*

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ABSTRACT
The development of intensive rearing guinea fowl is very little used; however, it is a good chance of recovery of the animal due to nutritional and dietary outstanding of its meat and eggs. The aim of this study conducted in Porto-Novo (Benin),is to evaluate the sex reversing in guinea fowl and the parameters of production and reproduction of the bird by different levels of incorporation of peanut *(Arachis hypogea)*'s powder in the food. The number of males from the breeding of 150 guinea fowl eggs incubated varies from 52 in the control group and 99 in lot 4 (4% peanut powder for 2 weeks) ($p < 0.05$). The fertility rate (TF) is between 84% (control group) against 95.33% in lot 4 ($p < 0.05$). For the hatching rate (TE), the results ranged from 70% for the control group and 92% for lot 3 ($p < 0.05$). As for the production of eggs, the control group and the lot 3 induced the highest production (36.71 eggs per week). The eggs from the control group was heavier than the others (45.15 g) ($p < 0.05$). The conversion ratio is the highest (5.68:1) for lot 4 in the 3 rd week. The peanut powder has induced an increase in the proportion of male guinea fowl and has positively influenced reproductive parameters; however it has not a favorable effect on the rate of lay in the guinea fowl breeding *"Numida meleagris* ".

INTRODUCTION

The lack of animal protein in food is the prerogative of the countries in Africa south. In recent decades, the gap between supply (African livestock) and demand of the populations are increasing in these countries. This is due to the growth of the population that is recorded. Forecasts of demographic trends and growth of individual consumption of livestock products show that, by 2020, we have to produce over 100 billion tons of meat in developing countries (Faye and Alary, 2001); so raising guinea fowl meat can help this challenge. Unfortunately meleagriculture is handicapped by its low reproductive performance and productive (Agwunubi, 1990). The present study was to evaluate the effects of peanut powder on the reversing sex in the guinea fowl as well as the parameters of reproduction and production in the guinea fowl *"Numida meleagris"*.

MATERIALS AND METHODS

Heavy breed guinea fowl: fowl Grise Intensive standard GI 543 was used.

Peanut's powder

The roasted peanuts were ground into powder incorporated at different levels in the diet of guinea fowl.

Experimental groups, Food and device

250 breeding guinea fowl *Numida meleagris* 32 weeks old, raised in batteries were randomly selected to form five batches of 50 subjects:
control group: standard food without the peanut powder
lot 1: standard food and 2% peanut powder for 1 week
lot 2: standard food and 2% peanut powder for 2 weeks
lot 3: standard food and 4% peanut powder for 1 week
lot 4: standard food and 4% peanut powder for 2 weeks

The animals received during the period of breeding, spawning a food type, suitable for guinea fowl breeding, containing 2750 kcal of metabolizable energy and 14% crude protein. The consignment of animals has been rationed to 140 g/d. Guinea cocks donors, selected from the best breeders because of their body weight and sperm production were placed in individual cages and were subjected to 140 g / d with a diet containing 2800 kcal of metabolizable energy and 16% crude protein per kg

Getting the peanut powder

Seeds boiled peanuts were dried and powdered at the Laboratory of Pharmacognosy and Essential Oils based in Porto-Novo (Benin's political capital).

Artificial Insemination

A program of artificial insemination of females has been established. Semen was collected from each guinea-cock, by the technique of dorso-abdominal massage (Burrows and Quinn, 1935), at 2 collections per week. Females have been inseminated twice a week throughout the laying period using the technique of eversion and cloacal vaginal removal of a shallow, 2 to 3 cm, with a gun insemination (Brillard and De Reviers, 1989). After collection of sperm, the sperm concentration was measured using a direct reading photometer IMV, the semen was then diluted at the rate of one third (1 volume of semen to 2 volumes of 7% NaCl saline P/ V). The average volume of insemination was 27µl, containing between 80,106 and 120,106 spermatozoids. Insemination doses were introduced into flakes with a capacity of 0.54 cc.

Treatment of eggs and incubation

Eggs were collected daily, weighed, individually numbered and stored at room temperature. They were incubated weekly. Cycles of incubation lasted 27 days, including a mirage in the 5th and 24th days and transfer to the hatcher for 4 days. Incubators fitted with a rollover, were set at 37.7 ° C and 55-60% relative humidity. The hatcheries have been set on the first day to 37.4 ° C and 70% relative humidity at 36.4 ° C and 90% relative humidity during the last 2 days.

Measured parameters

The zootechnical parameters measured ie the amount of food consumed, the mortality rate, egg weight, feed conversion and reproductive parameters (fertility, hatchability, embryonic mortality) have been calculated.

Sex's identification of guinea fowl

The identification of the sex of guinea fowl was carried out by the cloacal orifice subjects after the age of 6 weeks. The legs of the animal in the supine position, held firmly with the left hand, index finger and thumb of the right hand used to clear the tail. In males, there is clearly the formation of the penis in a fold that is in the form of a comma, while the female has a simple genital eminence.

Statistical Analysis

The average rate of sex reversing, fertility and embryonic mortality of guinea fowl were calculated. They were compared in pairs with the Z-test with Yates correction in the software SigmaStat 3.1. A descriptive statistical analysis was performed to calculate means and standard deviations with respect to the rate of lay, egg weight and feed conversion with the software SAS (Statistical Analysis System, 2001).

RESULTS

After caging, no signs of disease or mortality were observed in guinea fowl breeders.

Rate of sex reversing in female guinea fowl feeded with different levels of peanut powder

The number of males from the breeding of 150 eggs incubated, is 52 in the control group, 86 in lo 1; 72 in lot 2; 96 in lot 3, 99 in lot 4. Reversing of sex for the guinea fowl male was significantly higher in lot 1, lot 3 and lot 4 ($p < 0.05$) compared with the control group. It is the same for lots 2 and 4 compared with each other (figure 1).

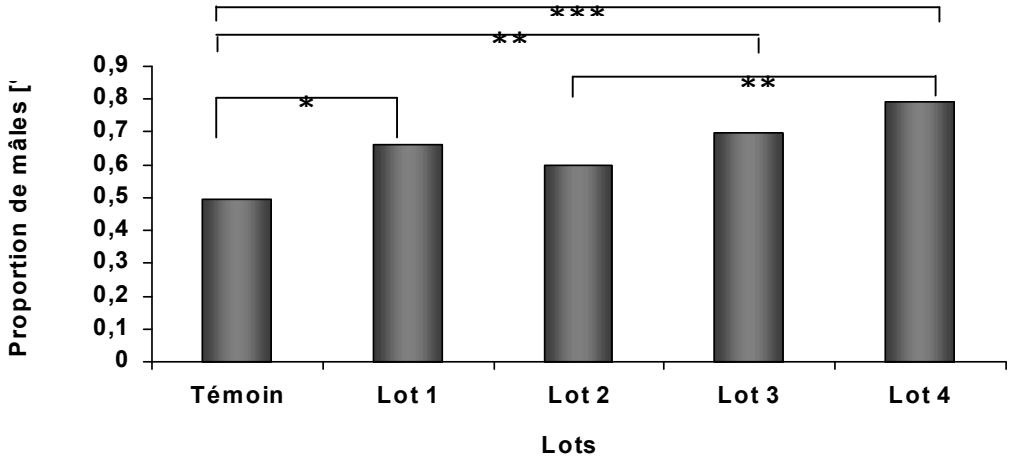

Figure 1: Percentage of sex reversal in female guinea fowl from fed with different rates of incorporation of peanut powder
*: Difference significant at 0.05%, **: Difference significant at 0.02%, ***: significant difference at the 0.01%
Control group: no peanut powder, **Lot 1:** 2% peanut powder for a week; **Lot 2:** 2% peanut powder for two weeks, **Lot 3:** 4% peanut powder for a week , **Lot 4:** 4% peanut powder for two weeks.

Settings incubation of guinea fowl feeded with different levels of peanut powder

The fertility rate (TF) in the control group was 84% against the respective rates of 90.66%; 83.33%; 95.33% and 87.33% for lots 1, 2, 3 and 4. Fertility rates were significantly higher in lots 3 and 4 compared with the control's one. It is similar for the fertility of lot 3 compared with lots 2 and 4 ($p < 0.05$). Regarding the hatching rate (TE), the following values were obtained: 70% for the control group, 86.66% for lot 1, 80% for lot 2, 92% for lot 3 and 83.33% for lot 4. The hatching rate between control group and lots 1, 2 and 3 and between lots 3 and 2; lots 3 and 4 are significant at 0, 05% (table 1).

Production performance of guinea fowl feeded with different levels of peanut powder

Egg production during a week is 32.71 for lot 1; 33.14 for lot 2; 36.71 for lot 3; 34.71 for lot 4 for and 36.71 for the witness lot. The production of the 4th week differs from the others weeks in lot 2; those of weeks 3 and 4 are different of the productions of weeks 1 and 2 for lot 3; those of weeks 3 and 4 are different from those of weeks 1 and 2 for the control group ($p < 0.05$). The rate of lay during the four weeks is generally in strict correlation with the production of eggs in different lots of guinea fowl.

As for the weight of individual eggs in the control group, the weight of the guinea fowl's eggs is around 45.15 g. The same weight in weeks 2, 3, and 4 for the control group, statistically different from those of other lots ($p < 0.05$). The index of the highest conversion (5.68) is obtained at the 3rd week with the lot 4. The highest conversion ratio in the control group (5.38) is obtained in the fourth week and is different from the results of the others weeks ($p < 0.05$) (Table 2).

TABLE 1: Parameters of incubation in guinea fowl feeded with different levels of peanut powder

Lots	OI	OFM	TF [(OFM / IO) * 100]	TE [(PE / IO) * 100]	TME [(ME / OFM) * 100]	Comparison (Z-test, Yates correction)
control	150	125	84	70	16	TF: z = 1.436, p = 0.151
Lot 1	150	136	90.66	86.66	4.41	TE: z = 3.132, p = 0.002 *
control	150	125	84	70	16	TF: z = 1.680, p = 0.093
Lot 2	150	125	83.33	80	4	TE: z = -0.0278, p = 0.978
control	150	125	84	70	16	TF: z = 4.492, p = 0.001 *
Lot 3	150	143	95.33	92	3.49	TE: z = 2.886, p = 0.004 *
control	150	125	84	70	16	TF: z = 2.378, p = 0.017
Lot 4	150	131	87.33	83.33	4.58	TE: z = 0.582, p = 0.560
Lot 1	150	136	90.66	86.66	4.41	TF: z = 1.280, p = 0.200
Lot 2	150	125	83.33	80	4	TE: z = 1.583, p = 0.114
Lot 1	150	136	90.66	86.66	4.41	TF: z = 1.254, p = 0.210
Lot 3	150	143	95.33	92	3.49	TE: z = 1.583, p = 0.114
Lot 1	150	136	90.66	86.66	4.41	TF: z = 0.591, p = 0.555
Lot 4	150	131	87.33	83.33	4.58	TE: z = 0.674, p = 0.500
Lot 2	150	125	83.33	80	4	TF: z = 2.681, p = 0.007 *
Lot 3	150	143	95.33	92	3.49	TE: z = 3.027, p = 0.002 *
Lot 2	150	125	83.33	80	4	TF: z = 0.527, p = 0.598
Lot 4	150	131	87.33	83.33	4.58	TE: z = 0.728, p = 0.466
Lot 3	150	143	95.33	92	3.49	TF: z = 2.010, p = 0.044 *
Lot 4	150	131	87.33	83.33	4.58	TE: z = 2.156, p = 0.031 *

*: Difference significant at the 0.05%

OI: incubated eggs, **OFM:** fertile eggs after Mirage, **TF:** Fertility rate in **percent; TME:** embryonic mortality rate in percent; **TE:** Hatchability percentage

Control group: no peanut powder, **lot 1:** 2% peanut powder for a week; **lot 2:** 2% peanut powder for two weeks, **lot 3:** 4% peanut powder for a week, **lot 4:** 4% peanut powder for two weeks.

DISCUSSION

Rate of sex reversing in female guinea fowl feeded with different levels of peanut powder

The sex reversing was carried out by Lord (1979) in chickens. This author has obtained a report of five males to one female by injecting an aqueous extract of garlic in chicken eggs. Using different rates of incorporation of the peanut powder in the food guinea fowl for one or two weeks, the eggs inseminated and incubated have given birth to the proportions of males that exceed the ratio of one male to one female usually expected. The proportion of males would be obtained due to the action of peanut powder. According to Rance (2008), peanut seeds contain among other constituents, zinc at a rate of 4%. However, according to McGeown (1973), zinc, natural aphrodisiac is an anti-aromatase. The aromatase inhibitors prevent the conversion of testosterone to estrogen, the mechanism by which female sex could gradually develop into males. Moreover, according to Lord (1979), the female birds are heterogametic. The sex of offspring is determined by the heterogametic sex. On the contrary, in mammals, the male is heterogametic. The avian sex is determined prior to ovulation, not by the male but by the female; in contrary to what happens in mammals in which sex is determined by the male and after fertilization. Thus, peanut powder, which contains zinc, when mixed with the food has time to act on egg formation in guinea fowl breeders. Artificial insemination made while promoting the penetration of the male gamete in the bud now to become fertile. Such practices are used today in fish farming, to reverse the sex of the fish through the use of Methyltestosterone, biotechnology operation that costs for fish breeding.

Settings incubation of guinea fowl feeded with different levels of incorporation of peanut powder

The average fertility rate of eggs inseminated with the guinea fowl in a cage (84% in the control group) was registered with the guinea fowl raised in the ground and carried out in natural reproduction (85.8%). These results are very similar and even higher; the incorporation of peanut powder can be attributed to the control of the insemination technique, including the quality of semen used fresh without undergoing a conservation process what is notified by Seigneurin Blesbois (2005). These authors showed that the rate of fertility in the fowl inseminated could be very high (90-97%). But the effectiveness of insemination with sperm stored decreases with age of the female up to 35-59 weeks (Blesbois and Hermier, 1990). Similarly, peanut powder would have a positive effect on the fertility rate among guinea fowl breeders. Indeed, ground peanuts *(Arachis hypogea)* contains anti-oxidants such as vitamins C, E and A. These vitamins are regularly distributed in the drinking water; even in small doses are powerful anti-stress for poultry farming in tropical environments.

The hatching rate by 70% in the control group and 92% in lot 3 were higher than the performance achieved with eggs Guinea fowl in naturally fertilized soil (66%). These results indicate a greater ability to hatch eggs from caged guinea fowl. Ancel et al (1994) reported values of hatchability between 78 and 81%, and show that the improvement of this parameter is partly due to the optimization of incubation conditions and hatching.

TABLE 2: Parameters of production in guinea fowl feeded with different levels of peanut powder

Lots	**Weeks**	**Number of eggs per week**		**Rate of lay**		**Weight of individual eggs**		**Overall weight of the eggs**		**Feed conversion**	
		Average	**Standard error**	**Average**	**Standard error**	**Average**	**Standard error**	**Average**	**Standard error**	**Average**	**Standard error**
1	1	31.0000000a	1.8442667	62.0000000a	3.3896100	44.5700000a	0.5202841	1381.27286a	94.28279	5.06857143a	0.30100534
	2	32.7142857a	1.8442667	65.4285714a	3.3896100	44.5600000a	0.5202841	1457.95429a	94.28279	4.82000000a	0.30100534
	3	32.5714286a	1.8442667	65.1428571a	3.3896100	44.5700000a	0.5202841	1451.18143a	94.28279	5.07000000a	0.30100534
	4	32.1428571a	1.8442667	64.2857143a	3.3896100	45.1700000a	0.5202841	1451.50286a	94.28279	4.95714286a	0.30100534
2	1	33.1428571a	1.8442667	66.2857143a	3.3896100	45.4400000a	0.5202841	1506.24571a	94.28279	4.67000000a	0.30100534
	2	31.2857143a	1.8442667	61.1428571a	3.3896100	45.4385714a	0.5202841	1421.74571a	94.28279	5.04714286a	0.30100534
	3	30.2857143a	1.8442667	60.5714286a	3.3896100	45.4500000a	0.5202841	1376.55714a	94.28279	5.18000000a	0.30100534
	4	24.3428571b	1.8442667	57.4285714a	3.3896100	45.8700000a	0.5202841	1317.38286a	94.28279	4.41285714a	0.30100534
3	1	36.2857143a	1.8442667	72.5714286a	3.3896100	45.1500000a	0.5202841	1637.80714a	94.28279	4.33428571b	0.30100534
	2	36.7142857a	1.8442667	73.4285714a	3.3896100	45.1500000a	0.5202841	1657.54286b	94.28279	4.26571429b	0.30100534
	3	30.7142857b	1.8442667	61.4285714b	3.3896100	45.1500000a	0.5202841	1385.29286b	94.28279	5.30000000a	0.30100534
	4	30.8571429b	1.8442667	61.7142857b	3.3896100	45.1400000a	0.5202841	1393.05143b	94.28279	5.09571429ab	0.30100534
4	1	34.7142857a	1.8442667	69.4285714a	3.3896100	44.6714286a	0.5202841	1546.12857a	94.28279	4.58714286a	0.30100534
	2	33.7142857a	1.8442667	67.4285714a	3.3896100	44.8357143a	0.5202841	1504.00000a	94.28279	4.69000000a	0.30100534
	3	29.5714286a	1.8442667	57.8571429b	3.3896100	44.5500000a	0.5202841	1317.69857b	94.28279	5.68142857b	0.30100534
	4	30.2857143a	1.8442667	60.5714286a	3.3896100	44.9700000a	0.5202841	1218.87286b	94.28279	5.30142857b	0.30100534
control	1	36.7142857a	1.8442667	73.4285714a	3.3896100	41.9700000a	0.5202841	1538.18286a	94.28279	4.63000000a	0.30100534
	2	32.2857143a	1.8442667	64.5714286a	3.3896100	45.1500000b	0.5202841	1456.97000b	94.28279	4.80428571a	0.30100534
	3	31.1428571b	1.8442667	62.2857143b	3.3896100	45.1500000b	0.5202841	1406.15714b	94.28279	4.99857143a	0.30100534
	4	29.0000000b	1.8442667	58.0000000b	3.3896100	46.2828571b	0.5202841	1149.18286c	94.28279	5.38285714b	0.30100534

The farming method of breeding cages certainly raises production costs but the most favorable hygienic conditions are very beneficial to poultry. In addition, contamination and breakage of eggs is reduced. The hatching rate means 72 and 77% are retained for breeding guinea fowl meat conducted intensive system (Brillard, 1992). Mortality rates ranging from 3.49% to 16% is high compared to the 2% rate reported by Seigneurin and Blesbois (2005). Taking into account these data, the performance levels achieved in our trial indicate that there is important to reduce the rate of embryonic mortality by optimizing incubation conditions.

Production parameter of guinea fowl feeded with different rates of incorporation of peanut powder

The parameters recorded nesting in this trial was generally below the standard values adopted for the guinea fowl caged in intensive system (Le Coz Douin, 1992). Average food consumption of guinea fowl was 140 g/d. Nahashon et al (2006) reported average consumption levels of the guinea ranging from 100 to 120 g/d, depending on stocking density practiced (3, 2, 1 guinea fowl/cage). Nahashon et al (2007) have shown that consumption in guinea fowl in a cage is increasing until the 21st week, it tends to level off thereafter. According to these authors, the richness of the food in EM and PB does not seem to significantly intervene in the regulation of food in guinea fowl beyond the 21 th week of age. Density observed in this study is 2 per cage guinea elderly subjects 32 weeks. The average weight of the egg obtained in our test (45.15g) seems less than the standard intensive livestock selected (48 g) Douin Le Coz (1992) but similar or even higher than the performance obtained in similar conditions by Dahouda et al (2008). These authors reported mean weights of eggs ranged from 37.5 to 43.2 g in the local fowl. Average weights ranging between 56.1 and 58.7 g were recorded by Oyejola and Adeyemo (2004) in guinea fowl *Numida meleagridis* conducted in a cage. Savior (1979) reported average weights of eggs from 43.1 to 47.9 g in selected commercial guinea fowl. According to Oke et al (2004), egg weight tends to increase with the advance in the laying cycle, but the mass of egg produced (g of egg/ day) tends to decrease. According to Sanfo et al (2007), the weight of the egg is incubated an economic interest test that determines the strong growth performance of guinea fowl.

Egg production is lower than that obtained with commercial guinea fowl selected (Sauveur, 1979) that reaches from 134 to 154 eggs per laying cycle. Fani et al (2004) reported values ranging from 93 to 107 eggs / guinea fowl in improved system. Ravi Kumar et al (2005) report the performance of laying from 129 to 146 eggs / guinea fowl with different strains of guinea fowl and various hybrid cross. The intensity values have been laying lower than those reported by Lord (1979) in selected commercial guinea fowl (77 to 88% at the peak of spawning from 58 to 66% in average). The use of peanut powder does not seem to improve the rate of lay in guinea fowls. While the system of cage improves the hygienic conditions of production, but environmental conditions also influence the rate of lay. Indeed, guinea fowl are raised in urban areas where the stress conditions mainly recorded sounds every night would create nuisances to guinea fowl. The lighting conditions were not met in laying hen houses. The average feed conversion was 5.38 g/g in the control group but the values of 5.68 g/g were recorded in some lots. These values are significantly better than those of between 5.9 and 7.5g/g, reported by Nahashon (2007) in the guinea fowl in a cage, those reported by Fani et al (2004), between 5.7 and 5,9g/g in the guinea fowl high in improved system. This proves that although the rate of lay is relatively small, egg weight is acceptable, food and peanut powder could have a positive effect on egg weight of guinea fowl.

CONCLUSION

The use of powder peanut *(Arachis hypogea)* had a beneficial effect on the sex reversing in guinea fowl. The study to obtain an additional rate of males by almost 40% compared to the control group. Insemination technique used has produced interesting results. However, some performance fell short of the results recorded in guinea selected, or those conducted in intensive. Although the weight of hatching eggs is acceptable, the production parameters can be enhanced by a favorable action on environmental factors. The incorporation rate of peanut powder and length distribution are the two factors that influenced the reversal of the sex of guinea fowl. It appears from this study that the powder peanut *(Arachis hypogeae)* increases the number of male guinea fowl and positively influences reproductive parameters, however it has not a favorable effect on the rate of lay in guinea fowl breeding.

REFERENCES

Adeyemo, A.I and Oyejola, W. (2004) Performance of guinea fowl Numida meleagris fed varying Levels of poultry droppings. *International Journal of Poultry Science,* 3 (5), 357-360.

Ancel, A.J. and Armand, H. (1994) Optimum incubation conditions of the domestic guinea fowl egg. *Br Poult. Sc.,* 35 (2), 227-240.

Blesbois, E. and Hermier, D. (1990) Effects of high-density lipoproteins on storage at 4 ° C of fowl spermatozoa. *J. Reprod. Fert.,* 90, 473-482.

Brillard, J.P (1992) Controlling reproduction in poultry. *Ann. Zootech.,* 41, 297-303.

Dahouda, M. (2008) Contribution to the study of the diet of local guinea fowl in Benin, and prospects for improvements using non-conventional resources. PhD in veterinary science, animal production and health option, University of Liège, 174 pp.

Fani, A.R, Lotfollahian, H. (2004) Economical Evaluation in traits of Iranian native guinea fowls (Numida meleagris). The Joint Agriculture and Natural Resources Symposium, Tabriz-Ganja, May 14-16, 2004, 1-3.

Douin Le Coz, J. (1992) The breeding of guinea fowl. Ed Le Point Vétérinaire, Maison Alfort, pp. 252.

Nahashon, S.N. and Amenyenu, D. (2006) Effect of varying energy and crude protein metabolization concentrations in diets of pearl gray guinea fowl pullet. 1. Growth performance. *Poultry Science*, 85, 1847-1854.

Nahashon, S.N. and Amenyenu, D. (2007) Effect of varying concentrations of dietary crude protein and energy metabolization is Laying performance of pearl gray guinea fowl hens. *Poultry Science*, 86, 1793-1799.

Oke, U.K.U. and Nwachukwu, E.N. (2004) Association Between body weight and egg production traits Some in the guinea fowl (*Numida meleagridis galeata*. Pallas). *Livestock Research for Rural Development,* 16 (9), 7 pp.

Ravi, K.K. and Indira, N. (2005) 2nd cycle of guinea fowl production and performance combination Suitable for commercial production. Summary in Poulvet.com, 111pp.

Sanfo, R. and Ogle, B. (2007) Egg weight of fowl local (*Numida meleagridis*) in the central region of Burkina Faso: relationship with the variables of artificial incubation and production of guinea fowl. *Tropicultura,* 25 (3), 184-188.

Sauveur, B. (1979) Test to determine the need for phosphorus guinea fowl breeders. *Ann. Zootech.,* 28 (1), 109-119.

Seigneurin, F. and Blesbois, E. (2005) Development of a method of freezing semen of guinea fowl. Proceeding of the sixth day of Poultry Research, St Malo, 30 and March 31, 2005, 563-567.