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Growth performance and carcass traits in broilers : comparison among commercial strains in Senegal

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نتائج النمو و الخصائص الجسمية للحوم الديوك : مقارنة بين أنواع في السينغال.

تهدف هذه الدراسة إلى مقارنة نتائج النمو بين ثلاثة أنواع من دجاج اللحم المنتشر في السوق السينغالية. وقد اعتمد على 405 موضوع، 135 من كل واحد من هذه الأصناف : jupiter Vedette و Cobb 500 . وقد لوحظت اختلافات مهمة في الوزن بين الأنواع عند 1j من العمر. وفي الأسبوع الثامن يصل الوزن إلى 1920 غرام، 2096 غرام و 2030 غرام على التوالي عند jupiter Vedette ولدى Cobb 500 ($p<0,05$)، لكن مفعول الجذمة على نسبة الاستهلاك غير مهم ($p>0,05$). ولايوجد هناك اختلاف كبير في التركيب بين الأنواع الثلاثة، ومع ذلك لوحظ أكبر هيكل لدى Cobb 500.

الكلمات المفتاحية : نتائج النمو – الأصناف – دجاج اللحم – السينغال.

Performance de croissance et caractéristiques de carcasse de poulets de chair: comparaison entre souches commercialisées au Sénégal

Cette étude vise à comparer les performances de croissance de trois souches de poulets de chair ccommercialisées au Sénégal. Elle a porté sur 405 sujets dont 135 de chacun des génotypes suivants: Jupiter, Vedette et Cobb 500. Des différences significatives de poids à 1 j d'âge ont été observées entre les souches. À l'âge de 8 semaines le poids est de 1920g, 2096g et 2030 g respectivement chez Cobb 500, Jupiter et Vedette. La consommation d'aliments ($P<0,05$) est plus elevée chez Jupiter et Vedette que chez Cobb 500 ($P<0,05$) mais l'effet souche sur l'indice de consommation n'est pas significatif ($P>0,05$). Il n'existe pas de différence importante de composition corporelle entre les trois souches. Cependant, le rendement en carcasse le plus élevé a été observé chez Cobb 500.

Mots -clés: Performances de croissance - Caractéristiques de carcasse - Génotype - Poulet de chair - Sénégal

Growth performance and carcass traits in broilers : comparison among commercial strains in senegal

This study compares growth performance of three broiler strains in Senegal. Data were collected on 405 birds (135 Cobb 500, 135 Jupiter and 135 Vedette). Significant differences of body weight were observed among strains at one day of age. At 8 weeks, the body weight was 1920 g, 2096g and 2030g respectively in Cobb 500, Jupiter and Vedette. Feed and water intakes were higher in Jupiter and Vedette than in Cobb 500 ($P<0.05$) but the food/gain ratio was not significantly influenced by genotype ($P>0.05$). There was no body composition differences amongst strains, though the highest carcass yield was observed in Cobb 500.

Keywords: Growth performance - Carcass traits - Genotypes - Broilers - Senegal

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INTRODUCTION

In spite of the well known pastoral vocation of Senegal, the level of meat intake decreased from 21.5 kg in 1960 to 13 kg in 1974 and to 11 kg/year.inhabitant in 1990 (MRA, 1988). This decrease in the meat consumption *per capita* is partly due to the increasing demographic growth rate and to the effect of drought on ruminant productivity during the last decade. In this context, modern poultry production appears as an alternative way to alleviate the rural protein malnutrition.

In Senegal, the efforts made in the last decade to enhance breeding development led to an increase in the number of bred chickens which rose from 2 000 000 in 1988 to 410 000 in 1992 (CNA, 1993). However, Growth rate is still low and mortality rate is high in poultry farms (Kebe, 1983 ; Haby Armana, 1994). These farms utilize stocks of birds whose parents and grandparents are developed and selected in the developed countries of temperate regions.

Due to the well known interactions between environment and genotype it is possible that the genetic improvements obtained in these regions may not be fully reproduced in a tropical environment (Katongole *et al.,* 1990). Also, different commercial strains of broilers are available in Senegal but little is known about their productivity (Laureent & Mesellati, 1990).

Thus, the objective of the study is to compare growth and carcass traits in three commercial strains of broilers.

MATERIAL & METHODS

• Housing and management of the birds

135 unsexed one day old chicks of each commercial hybrid broiler strains, namely Jupiter, Vedette and Cobb 500, were reared for 8 weeks. The chicks were hatched in Dakar from eggs imported from France. Each genotype was randomly divided into 3 groups of 45 birds. The birds were housed in deep litter pen and were heated by gas heaters.

Commercial chick starter and finisher diets were fed during the first 4 weeks and the last 4 weeks respectively. Water was provided *ad libitum*. The chemical composition of the starter and finisher diets is presented in table 1.

Table 1. Analysed composition (%) of starter and finisher diets

	Diets	
	Starter	Finisher
Dry mater (%)	88,73	87,83
Crude protein (%DM)	22,69	21,8
Crude fibre (%DM)	4,82	4,9
Ash (% DM)	7,5	6,46
Calcium (%DM)	0,86	0,75

• Data collection and analysis

The birds were weighed the first day and every week until the end of the experiment. Water and food consumption were determined daily by subtracting the quantities left in the feeders. At the end of the 8th week, all birds were slaughtered and eviscerated. Carcass, head, liver, and gizzard weights were recorded. Five carcasses from each genotype were randomly chosen and dissected. Muscles, fat and bone percentages were calculated in relation to eviscerated carcass weight. Data were compared using an analysis of variance according to the linear model Yij = u + ai + eij where:
Yij = data on the jth bird from the ith strain
ai = fixed unknown effect of the ith strain
eij = residual

The treatment means were compared using the Student-Newman & Keuls test (Steel & Torrie, 1967). The prediction of carcass weight and composition from body weight was performed using a simple regression analysis (Neter & Wasserman, 1974).

RESULTS & DISCUSSION

• Growth performance: effects of genotype

Growth performance of the different strains are presented in table 2. The genotype significantly influenced the weight at one day of age ($P<0,001$). The Vedette strain is heavier than the Cobb 500 which, in turn, is heavier than the Jupiter. Differences in weight at one day of age among strains was reported by Malone *et al.* (1979) but not by Marks (1980) or Okwuosa *et al.* (1990) who did not see differences before the end of the first week. Although Vedette males are heterozygous for the sex linked incompletely recessive dwarf gene (Ricard, 1972), the superiority at one day of age of this strain on the others is in agreement with the feeble effects of that gene at hatching (Merat, 1990).

Table 2. Growth performance of different strains of broiler chicks

	Strains			
	Cobb500	Jupiter	Vedette	Effects
Body weight				
Day 1	38,2a	35,3b	39c	***
Day 28	416,8a	504,8b	533,8ab	***
Day 56	1919,9a	2096b	2030,3ab	**
Average Daily Gain				
ADG starter (g)	13,6a	16,8b	17,7b	***
ADG finisher (g)	52,9a	56b	52,9ab	t
ADG	33,8a	36,8b	35,6ab	**
Average Daily Food Intake				
ADFI starter (g)	42,1a	50,5b	48,0b	*
ADFI finisher (g)	116,1	12+,8	121,6	ns
ADFI (g)	79,3a	88,7b	84,8ab	*
Feed/Grain ratio	2,35	2,41	2,38	ns
Average daily water intake (g)	140	155,8	143,5	ns

ns: non significant ; t: P<0,1 ; *: P<0,05 ; **: p<0,01 ; ***: P<0,001

The weight at 8 weeks of age (P<0,01) and the average daily gain at starter (P<0,001) and at finisher phases (P<0,1) are different among strains. The eight weeks live weight of Vedette and Jupiter is 6 % respectively higher than Cobb's. This genetic variability was reported by other authors (Malone *et al.*, 1979 ; Ayoub *et al.*, 1980 ; Maarks, 1980 ; Giordani *et al.*, 1993).

In the three strains, growth rate at starter is almost half that reported by Larbier & Leclercq (1992 ; 33,1 g/day) in France while at finisher, our results compare favorably with theirs (59 g / day). This low growth rate at starter might be the consequence of the low level of the essential amino acids in the diets (Table 1). The better performance observed in the second phase can be explained either by the compensatory phenomenon (Cherry *et al.*, 1978) or by the lowestt requirements of the birds. The strains responses are however higher than those reported by Habyarimana (1994; 1240 g body weight at 7 weeks) through a concurrent survey in different poultry farms in Dakar and suggest the main role played by breeding conditions in the low productivity of poultry production in Dakar.

The genotype has a significant (P<0,05) effect on feed consumption at starter but not at finisher phase. Feed consumption is higher in Vedette and Jupiter than in Cobb 500. This result is supported by previous works (Okwuosa *et al.*, 1990 ; Garcia *et al.*, 1992). According to Marks (1980), genotype dependent difference in feed consumption can be detected at hatching an is an important factor in growth variability among strains. The higher water consumption in Vedette and Jupiter is certainly the result of the logical link between water and feed consumption.

There was no significant effect of genotype on the Feed/Gain ratio, but Cobb 500 has a slightly better feed efficiency.

- **Carcass traits : effect of genotype and relation with live weight**

The carcass traits of the different strains under study are shown in table 3. The carcass, the gizzard and the liver weights are higher in Jupiter than in the other strains (P<0,1). The high percent weight of these two organs in Jupiter and Vedette in suggest a relatively important internal organs development in these strains and can explain their lower carcass yield. Genotype effect on the carcass composition is not significant. Garcia *et al.* (1992) did not observe differences in carcass yield and body composition among strains. With the exception of Giordani *et al.* (1993) who reported internal fat weight differences among commercial strains, the genotype effect on body composition seem to be mainly observed between extreme genotypes (El-Attar, 1985 ; Ricard & Leclercq, 1985).

Table 3. Carcass traits of different strains of broiler chicks

	Strains			
	Cobb500	Jupiter	Vedette	Effects
Body weight				
Carcass	1537,7a	1630,6b	1529,3ab	t
Head	41,2	51,0	55,9	ns
Neck	12,1a	14,7b	11,7a	*
Feet	64,4	74,7	81,9	ns
Skin	137,4	139,5	168,2	ns
Gizzard	62,9	64,3	63,5	ns
Liver	49,9a	46,5b	42,7ab	**
Heart	12,1a	14,7b	11,7a	*
Muscle	528,4	556,2	582,4	ns
Bone	255,6	309,2	332,9	ns
Fat	53,2	52,9	58,0	ns
Yiedl (%)				
Carcass	78,4a	76,1b	75,5b	***
Gizzard	4,0a	4,1a	4,27b	t
Liver	2,72	2,90	2,87	ns
Heart	0,8	0,91	0,79	ns
Muscle	31,8	32,0	30,66	ns
Bone	15,78	14,16	17,9	ns
Fat	3,1	3,06	3,2	ns

ns: non significant ; t: P<0,1 ; *: P<0,05 ; **: P<0,0 1 ; ***: P<0,001

Body weight had high and positive correlation with the absolute weight of all the carcass traits under study except carcass fat weight in Jupiter strain. It was loosely correlated with muscle, fat and bone percentages, and with total yield. The prediction equations in the different strains were presented in table 4. Body weight could be used to predict carcass weight and weight of different cuts with good accuracy (R^2 = 0,56 to 0,99). However, carcass fat weight in the Jupiter strain, relative weight of the tissues and total yield could not be predicted satisfactorily from body weight (R^2 = 0 to 0,43). The results were in agreement with those reported by Mahapatra & Pandey (1989).

Table 4. Simple regression equations for prediction of different carcass traits from weight (x)

Strains	Regression equations	R2
Cobb 500	Y_1= -72,15 +0,82x	0,96***
	Y_2= -84,16 +0,37x	0,98***
	Y_3= -8,85 +0,04x	0,86*
	Y_4= -8,20 +0,16x	0,99***
	Y_5= 73,41 +0,002x	0,07**
	Y_6= 26,78 +0,001x	0,32
	Y_7= 4,5 +0,0004x	0,15
	Y_8= 15,78 +0,0000002x	0,0
Jupiter	Y_1= -128,2 +0,82x	0,95***
	Y_2= -93,05 +0,38x	0,97***
	Y_3= 6,71 +0,03x	0,21
	Y_4= -29,37 +0,20x	0,93**
	Y_5= 69,80 +0,003x	0,11**
	Y_6= 26,11 +0,003x	0,43
	Y_7= 3,30 -0,0004x	0,27
	Y_8= 16,315 -0,0009x	0,09
Cobb 500	Y_1= -72,85 +0,79x	0,96***
	Y_2= 37,67 +0,28x	0,96**
	Y_3= 21,85 +0,019x	0,56
	Y_4= 68,75 +0,14x	0,81*
	Y_5= 70,62 +0,002x	0,09*
	Y_6= 31,72 +0,007x	0,06
	Y_7= 3,89 - 0,0009x	0,19
	Y_8= 20,65 -0,002x	0,19

*P<0,5 ; **P<0,1 ; ***P<0,001 ; Y_1 : eviscered carcass weight ; Y_2:muscle weight ; Y_3 : carcass fat weight ; Y_4: bone weight; Y_5:total yield ; Y_6: muscle ; Y_7 : fat ; Y_8 : bone

CONCLUSION

This study revealed that in the Senegal breeding conditions, although Cobb 500 had a slower growth rate, they had better carcass traits and seemed to be more efficient in food transformation than the other strains. The important difference between our results and technical performance of Senegalese farmers shows the key role of rearing conditions in the low productivity of modern poultry farms in Dakar which is the main poultry production area of Senegal. A better supplementation of broiler diets in essential amino acids, particularly at starter and a strict observation of husbandry and sanitary norms can help alleviating these constraints and give to broiler production its competitivity.

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