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Barymetries Formulas and Control of Growth of Breed Cattle at Dihessé Breeding Farm in Congo Brazzaville

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Abstract: The follow-up of the growth of the Ndama bovines through the barymetric formulas has been approached with Congo Brazzaville, in the Technical Center of Support of Dihessé which aims at the multiplication and diffusion of the animals in the country medium and the repopulation of the official breeding. This study makes a development of the barymetric equations of females and males of Ndama of birth in 20 months of age. By age group, the thoracic perimeter (Pt) and the live weight (PV) have been collected for 253 males and 405 females. The males are born with an average weight from 19.5±0.5 kg and females with 18.14±0.5 kg (td> 1.96). In the 16th month the live weight is not different but significant (114.5±10 kg and 90.1±5 kg). The thoracic perimeters were 62.2±6 cm and 60.7±11 cm with the birth and 110.5±3 cm and 103.8±6 cm in the 16th month (td>1.96). The coefficients of correlation between the perimeter thoracic and the live weight is higher than 0.80 in the three phases of growth observed. This evaluation corresponds more to one series of segments of straight regression line. The equations of regression are relatively higher in the males than in the females ($Y = 0.797 X - 5.741$ et $Y = 1.899 X - 111.918$) to 10 months of age.

Key words: Cattle, growth, barymétrie, Congo

INTRODUCTION

The majority of the bovine breeding in Congo Brazzaville have like main objective the production of meat. The meat, part consumable of the carcass is the result of the growth and the development of animal (Soltner, 2001). Facing to the growth of the needs and the constant one unbalanced between offer and asks it, with that the blaze of the prices of the foodstuffs has added, appeared for a few years the need; to improve the performances of growth of the pets so to increase the livestock and the number by kilograms of meat per unit of area. The control of the weight of the young animals prove necessary birth until with the adult weight; what allows the follow-up of the Ponder growth of the young animals until with adulthood and identification of the possible ponder disturbances (Coulomb, 1976; Delage *et al.*, 1955). This operation particularly constitutes the base of any improvement of the livestock of the beef breeds. This knowledge of weight allows the proportioning of the drugs and rationing according to the weight and also appreciation of the precocity of the young animals (Coulomb, 1976; Huxley, 1932; Johansson and Hildeman, 1954). Thus we initiated the method estimate of ponder growth of weight with the help of the barometric formulas are equations of prediction in the center d' technical support of dihessé, a center creates

for the multiplication and the diffusion of the animals in the breeding of Congo thanks to the Prodder project, initiated by Congolese state.

MATERIALS AND METHODS

Area study and pastures: The center is located in the oriental party of the plain of Niari, under the low Congolese climate characterized by one season of rains (October to May) and a dry season (June at September). The season of rains is intersected a small season dries between January and February (Samba, 2002). A formation schistocalcaire gives to the center an argillaceous heavy ground more or less satirized (Gattolin, 1986), on which it has 20.000 hectares of shrubby savanna, with *Hyparrhenia* prevalence will *diplandra*, forming a natural pasture of variable quality C following the seasons (Diamouanga, 2001; Samba, 2002). Several courses of water with permanent mode sprinkle this plain and constitute for the cattle of the sources; watering and of the corridors of pasture and service. The center exploits 1800 hectares for a livestock of 677 bovines of race Ndama trypanotolerante, that is to say 0.37 bovine per hectare and year. The rotations of pasture coupled with the practice of fires allow to obtain, even in season dries of the fodder of quality (Landais, 1983). The value of this pasture varies from 1600-2000

UF/ha and 4 with 12 kg of MAD/ha, according to the seasons and especially from the vegetative state (Boudet, 1984).

Control of the herd: The animals graze all the day and the evening they join the park of night or sorting where they undergo various treatments and prophylactic handling. The cattle population of the ranch occurs in endogamy. It set out again in small herds according to the physiological state of the animals. Go up are directed have rate/rhythm of the returns of the colors. The villages are spread out throughout the year. The first calf cows are observed towards 36 months age. A food complement composed of mixed is of sound of corn is distributed in the park of night, especially in dry season when the vegetation decreases. Stone to be licked is distributed permanently like source of rock salt and vitamins, and also to preserve the docility of the animals and to facilitate their control. This stone to be licked is consisted of rock salt, limestone, the vitamins and cement.

Data-gathering: A population of 219 animals, including 80 males and 139 females from 0-19 month, constituted the biological material of this study. The weighting took place with 0, 6, 12 and 16 month age. Only the Thoracic Perimeter (Pt) is retained in this study like measurement of work because of the facility of measure to the village breeding and its more convenient linear adjustment and more precise with the Live Weight (statement) according to certain authors (Delage *et al.*, 1955; Poivey *et al.*, 1980). This thoracic perimeter is measured with help of; a ribbon circumference with the passage of the straps (Symoens and Hounsou-Ve, 1991). The statistical analysis of the classified data by sex, by age is made with the Excel software (c) and Stat View (c). What license: - the establishment of the curves of ponder growth and the evaluation of the thoracic perimeter of the animals; - the study of connection thoracic weight sharp-perimeter by simple correlation then by regression linear ($PV = aPT + b$) and regression logarithmic curve (attention they are not the same coefficients, between the simple linear regression and the passage to the logarithm $\ln PV = a \ln PT + b$).

RESULTS AND DISCUSSION

Evolution of live weight and thoracic perimeter: The live weights and the average thoracic perimeters as well as the standards errors be the standard deviations calculated starting from the couples of data (PV-PT) of the animals are presented to the Tableau 1. Like all the data of ground, those unequally set out again in the age classes, with coefficients of variation going from 4-30%. The males are born with an average weight from 19.59 ± 0.50 kg and the females with 18.14 ± 0.52 kg, the difference not being significant ($td < 1.96$).

At 6 months, the males reach 66.58 kg then 82.22 kg in 12 months and 114.50 kg in 16 month; while the females have 61.80 kg in 6 months, 79.31 kg in 12 months and 90.10 kg with 16 month of age. The variations of live weight between males and females in 6 months and 16 month are significant with the threshold of 5% ($td < 1.96$) birth in the 16th month. Weights of birth of 17.7 kg for the males and 16.7 kg for the females of race Ndama; rammed were recorded at the research centre zoo technical of Minankro in Ivory Coast (Coulomb, 1976). These calves reach respectively, with the age of a year 129.7 kg for the males and 102.7 kg for the females; then, at two years: 227.7 kg for the males and 109.9 kg of live weight for the females. Weaker weights of birth at the Ndama bovines; rammed villagers herds of the north of the Ivory Coast respectively: 15 and 14 kg in the males and the females (Landais, 1983) were recorded. The growth of the bovines of our study is thus in the average of that of the of the same animals race. Their weights of birth are slightly higher, which could be a characteristic of Ndama Central Africa, since weights of birth from 20-25 kg were observed village of the democratic republic of Congo (former Zaire) (Schmitz, 1985). In Mali, the animals which are born to 13 kg reach 63 kg of live weight in 7 months. The conditions d' breeding of these animals are certainly element of difference in this ponder growth. With that the technique of barometry used adds which often can miss precision. That can also depend on the growing period during which measurements were taken (Boudet, 1984; Landais, 1983). The established curves of growth (Fig. 1), present in the two sexes an evolution in teeth of saw that is to say, a synchronous succession of ascending segments, particularly in the section ages of 4-7 months. But this growth of blows by blows is also characteristic of the animals in difficult medium because it mainly reflects the strong interactions between genetic factors and factors of environment such as the climate, the vegetation and the technique of control and food with weaning. It is possible to note two significant inflections: towards the age of 7 then in 10 months, subdividing the postnatal growth of the bovines in three phases: from 0-7 months, the curve is overall ascending with profits of weight of 249.5 g/j at the males and 224.33 g/j in the females. This catch of fast weight must be caused by mother's milk and can be with the good vegetation which allows the starting of weight; especially that weaning intervenes that around 9 months. From 8-10 months the curve presents a plate: a deceleration of growth certainly caused by the reduction in the maternal dairy production whereas the calves are not yet able to make up the deficit by an additional consumption of fodder. From 11-16 month at the males and month with 19 mois in the females, it occurs a renewal of growth which seems to indicate that these animals become ready to find their food in this medium after the stress of with weaning.

Table 1: Live weight and thoracic perimeter of ndama cattle

| Age (month) | Male | | | Female | | |
|-------------|------|-------------------------|-----------------------|--------|-------------------------|-----------------------|
| | n | PV (kg) M±m σ | PT (cm) M±m σ | n | PV (kg) M±m σ | PT (cm) M±m σ |
| 0 | 44 | 19.59±0.50 (3.36) | 62.25±0.52 (3.51) | 50 | 18.14±0.52 (3.72) | 60.70±0.59 (4.22) |
| 1 | 36 | 29.51±0.99 (5.97) | 71.66±0.81 (4.89) | 38 | 25.80±0.84 (5.20) | 68.05±0.72 (4.46) |
| 2 | 26 | 36.32±1.65 (8.43) | 76.50±1.22 (6.27) | 21 | 29.85±1.07 (4.94) | 72.80±0.97 (4.47) |
| 3 | 15 | 42.20±3.26 (12.66) | 81.20±2.06 (7.98) | 13 | 40.07±2.46 (8.90) | 79.76±1.67 (6.04) |
| 4 | 6 | 53.66±5.42 (13.29) | 87.66±2.91 (7.15) | 6 | 43.16±4.18 (10.26) | 81.66±3.37 (8.27) |
| 5 | 5 | 54.33±4.65 (10.42) | 88.32±2.80 (6.28) | 4 | 44.00±6.13 (12.26) | 81.75±3.57 (7.15) |
| 6 | 2 | 66.58±4.41 (6.25) | 95±00 (00) | 5 | 61.80±8.87 (19.85) | 91.20±3.93 (8.81) |
| 7 | 5 | 72±5.01 (11.22) | 96.60±2.47 (5.53) | 4 | 65.25±7.03 (14.07) | 94.75±3.97 (7.94) |
| 8 | 7 | 72.14±2.33 (6.17) | 99±1.16 (3.07) | 10 | 70.70±6.60 (20.90) | 96.30±3.36 (10.64) |
| 9 | 11 | 72.18±5.01 (16.63) | 96.54±2.41 (8.02) | 25 | 70.60±4.87 (24.37) | 97.12±2.28 (11.42) |
| 10 | 19 | 73.05±3.55 (15.50) | 97.15±1.26 (5.50) | 35 | 75.31±4.42 (26.20) | 97.88±1.94 (11.51) |
| 11 | 21 | 84.75±5.15 (23.64) | 101.52±2.11 (9.69) | 39 | 77.41±3.68 (22.99) | 97.88±2.90 (18.16) |
| 12 | 18 | 82.22±4.98 (21.13) | 100.61±1.83 (7.97) | 35 | 79.31±3.68 (21.78) | 100.37±1.53 (9.07) |
| 13 | 14 | 87.42±4.10 (15.37) | 103.57±1.82 (6.84) | 37 | 75.70±3.21 (19.56) | 98.70±1.47 (8.96) |
| 14 | 13 | 88.30±5.42 (19.57) | 104.46±2.25 (8.12) | 35 | 81.22±3.39 (20.08) | 100.54±1.47 (8.72) |
| 15 | 9 | 90.66±6.38 (19.16) | 106.33±2.39 (7.19) | 24 | 87.16±3.62 (17.78) | 102.83±1.62 (7.95) |
| 16 | 2 | 114.50±10.96 (15.50) | 110.50±3.18 (4.50) | 10 | 90.10±5.64 (17.86) | 103.80±2.20 (6.98) |
| 17 | | | | 6 | 98.50±7.60 (18.62) | 107.11±2.91 |
| 18 | | | | 5 | 94.40±5.98 (13.39) | 107.20±1.98 (4.44) |
| 19 | | | | 3 | 103.66±10.92 (18.92) | 112.33±3.40 (5.90) |

N = Nombre de bovines par classe; M = moyenne arithmétique; ± m = erreur standard; σ = écart type

The conditions prevailing breeding of M'Passa do not allow a total expression of the ponder capacities of the Ndama bovines; rammed. The males presented 62.25±0.52 cm of turn of chest to the birth, 95±00 cm in 6 months, 100.61±1.83 cm in 12 months and 110.50±3.18 cm in 16 month, against 60.70±0.59 cm with the birth, 91.20±3.93 cm in 6 months, 100.37±1.53 cm in 12 months and 103.80±2.20 cm in 16 month, for the females. The Ndama bovines are generally animals of intermediate size with turns of chest oscillating around 120-130 cm in 2 months ages (Coulomb, 1976; Planchenault *et al.*, 1984). Figure 2 shows an evolution of the thoracic perimeter comparable with that of sharp pea: even general pace, relative superiority of the males on the females with deviation always no significant. In spite of the number very disparate of the data by age

class and of the work conditions in the center, which are far from the rigor of control in station, these studied measurements keep real indicative characteristics of the animals and conditions of their breeding? These Ndama bovines; rammed are of small size with slow growth (Coulomb, 1976; Planchenault *et al.*, 1984; Planchenault *et al.*, 1986). Linear regressions and logarithmic curves of the live weights on the thoracic perimeters by phase of growth Linear regressions and logarithmic curves were applied to this classified data by phase of growth to obtain the barometric formulas of Table 2 and 3. The 658 couples of collected data translate a connection LW-TP very strong, as well in the males as in the females. Those vary with l' age but do not seem to be influenced by the sex of the animals. The coefficients of correlation regularly increase birth in

Table 2: Linear regression of live weight (Y) to thoracic perimeter (X) by growth phase

| Age | Sex | N | PV (cm) | PT (cm) | Coefficient de corrélation (r) | Regression equations Y = a X + b |
|--------------|-----|-----|-----------------------|-----------------------|--------------------------------|-------------------------------------|
| Birth | M | 44 | 19.59±0.50 (3.36) | 62.25±0.52 (3.51) | 0.83 | Y = 0.872 X-34.735 |
| | F | 50 | 18.14±0.52 (3.72) | 60.70±0.59 (4.22) | 0.86 | Y = 0.821 X-31.748 |
| 1-7 Months | M | 90 | 38.42±1.55 (14.73) | 77.62±0.98 (9.37) | 0.93 | Y = 1.524 X-79.885 |
| | F | 91 | 34.43±1.50 (14.38) | 74.76±1.01 (9.10) | 0.90 | Y = 1.412 X-71.143 |
| 8-10 Months | M | 37 | 71.94±2.19 (13.34) | 97.94±1.20 (7.34) | 0.84 | Y = 0.797 X-5.741 |
| | F | 70 | 73.07±3.01 (25.25) | 97.37±1.36 (11.45) | 0.74 | Y = 1.899 X-111.918 |
| 11-19 Months | M | 78 | 86.50±2.37 (21.00) | 103.02±0.97 (8.63) | 0.85 | Y = 2.242 X-144.529 |
| | F | 194 | 81.52±1.53 (21.38) | 101.06±0.67 (9.40) | 0.88 | Y = 2.133 X-134.107 |

Table 3: Logarithm regression of live weight LnY to thoracic perimeter Ln X by growth phase

| Age | Sex | N | Ln PV | Ln PT | Coefficient of correlation | Equation de regression LnY = aLnX + b |
|--------------|-----|-----|-----------------------|-----------------------|----------------------------|--|
| Birth | M | 44 | 2.961±0.025 (0.17) | 4.129±0.007 (0.05) | 0.86 | LnY=2.840LnX-8.769 |
| | F | 50 | 2.881±0.028 (0.20) | 4.103±0.009 (0.07) | 0.89 | LnY= 2.742LnX-8.373 |
| 1-7 Months | M | 90 | 3.587±0.035 (0.34) | 4.344±0.011 (0.11) | 0.94 | LnY= 2.861LnX- 8.842 |
| | F | 91 | 3.470±0.036 (0.35) | 4.307±0.012 (0.12) | 0.91 | LnY= 2.768LnX-6.570 |
| 8-10 Months | M | 37 | 4.258±0.031 (0.19) | 4.581±0.011 (0.07) | 0.84 | LnY = 2.363LnX- 6.570 |
| | F | 70 | 4.229±0.043 (0.36) | 4.571±0.013 (0.11) | 0.70 | LnY= 2.569LnX-7.515 |
| 11-19 Months | M | 78 | 4.430±0.027 (0.24) | 4.631±0.009 (0.08) | 0.86 | LnY= 2.756LnX- 8.334 |
| | F | 194 | 2.686±0.153 (2.15) | 2.834±0.160 (2.24) | 0.99 | LnY = 3.043LnX-9.744 |

19 month while passing by a maximum on the phase from 8-10 months, then an unquestionable increase in the last phase. This evolution corresponds to a series of straight regression lines with a model curvilinear; connection LW-TP appears stronger in the ascending phases of the curve of growth. The higher coefficient of correlation during lactation than during translated weaning can be the fact that for certain animals weaning does not occur very well like the habituation with bleaches on grass. The calculated coefficients of correlation are always higher than 80.0. Apart from the phase from 8-10 months, the coefficients of regression of the two types; equations are relatively higher in the males. That wants to say that for females even thoracic variation of perimeter, the males tend to gain plod weight that the females. The difference remaining despite everything no significant. The barometric formulas suggested remain valid for the bovines of Dihessé and in the village herds where the same conditions prevail; breeding. They are simple tools in their handling and useful, fault of adequate equipment, to follow the two-

phase or three-phase growth of the bovines. They make it possible to pose the preliminary acts of selection without risk to be mistaken. Growth of these bovines having to rectify itself with the improvement of the breeding conditions, a constant reactualization of these equations will allow to increase their effectiveness. The period of growth of this rustic race of the tropical mediums is prolonged until 4 years as also certain authors (Coulomb, 1976; Gattolin, 1986) report it. This study thus relates to the phase of rapid growth, characterized by a deceleration during the time of weaning. Natural pastures and stone to lick sufficient step to meet the needs for growth. It is possible to remove inflection of 7 months growth with an adequate food and to quickly reach 150 kg of live weights required to the heifers for their setting with the reproduction and that can decrease significantly; age of first projection fixed at 30 months. The organization of the reproduction and the improvement of food should push the bovines with a better externalization of their genetic potentialities. The production; simple tools for effective control of

growth in the villagers herds is possible by mathematical exploitation of relation LW-TP. since weights of birth from 20-25 kg were observed village of the democratic republic of Congo (former Zaire) (Schmitz, 1985). In Mali, the animals which are born to 13 kg reach 63 kg of live weight in 7 months. The breeding conditions of these animals are certainly element of difference in this ponder growth. With that the technical of barometry used adds which often can miss precision. That can also depend on the growing period during which measurements were taken (Boudet, 1984; Landais, 1983). The established curves of growth (Fig. 1), present in the two sexes an evolution in teeth of saw that is to say, a synchronous succession of ascending segments, particularly in the section ages of 4-7 months. But this growth of blows by blows is also characteristic of the animals in difficult medium because it mainly reflects the strong interactions between genetic factors and factors of environment such as the climate, the vegetation and the technical of control and food with weaning. It is possible to note two significant inflections: towards the age of 7 then in 10 months, subdividing the postnatal growth of the bovines in three phases: from 0-7 months, the curve is overall ascending with profits of weight of 249.5 gram a day (g a day) at the males and 224.33 g a day in the females. This catch of fast weight must be caused by to the mother's milk and can be with the good vegetation which allows the starting of weight; especially that weaning intervenes that around 9 months. From 8-10 months the curve presents a plate: a deceleration of growth certainly caused by the reduction in the maternal dairy production whereas the calves are not yet able to make up the deficit by an additional consumption of fodder. From 11-16 month at the males and until with 19 months in the females, it occurs a renewal of growth which seems to indicate that these animals become ready to find their food in this medium after the stress of with weaning. The conditions of breeding prevailing at dihesse do not allow a total expression of the ponder capacities o the Ndama bovines; rammed. The males presented 62.25±0.52 cm of turn of chest to the birth, 95±00 cm in 6 months, 100.61±1.83 cm in 12 months and 110.50±3.18 cm in 16 month, against 60.70±0.59 cm with the birth, 91.20±3.93 cm in 6 months, 100.37±1.53 cm in 12 months and 103.80±2.20 cm in 16 month, for the females. The Ndama bovines are generally animals of intermediate size with turns of chest oscillating around 120-130 cm in the age of 2 months (Coulomb, 1976; Planchenault *et al.*, 1984). Figure 2 shows an evolution of the thoracic perimeter comparable with that of sharp pea: even general pace, relative superiority of the males on the females with deviation always no significant. In spite of the number very disparate of the data by age class and of the work conditions in the center, which are far from the rigor of control in station, these studied

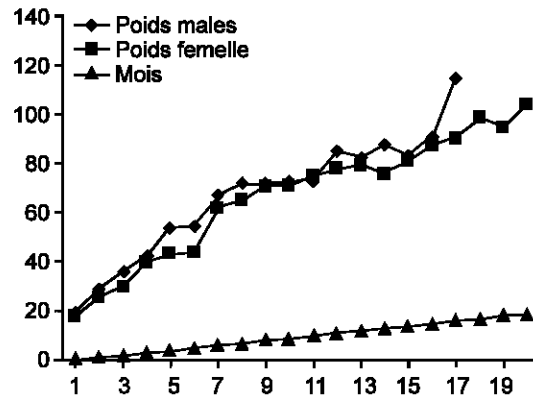


Fig. 1: Growth curves of ndama cattle

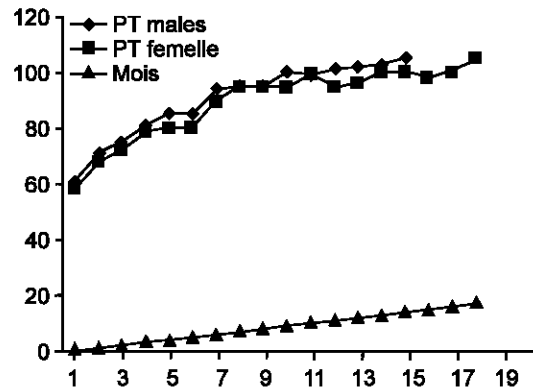


Fig. 2: Thoracic perimeter of ndama cattle

measurements keep real indicative characteristics of the animals and conditions of their breeding. These Ndama bovines; rammed are of small size with slow growth (Coulomb, 1976; Planchenault *et al.*, 1984; 1986).

Linear regressions and logarithmic equations of the live weights on the thoracic perimeters by phase of growth: Linear regressions and logarithmic curves were applied to this classified data by phase of growth to obtain the barometric formulas of Table 2 and 3. The 658 couples of collected data translate a connection LW-TP very strong, as well in the males as in the females. Those vary with age but do not seem to be influenced by the sex of the animals. The coefficients of correlation regularly increase birth in 19 month while passing by a maximum on the phase from 8-10 months, then an unquestionable increase in the last phase. This evolution corresponds to a series of straight regression lines with a model curvilinear; connection LW-TP appears stronger in the ascending phases of the curve of growth. The higher coefficient of correlation during lactation than during translated weaning can be the fact that for certain animals weaning does not occur very well like habituation with bleaches on grass. The calculated

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