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Research Paper zootechny

Poultry farming challenges in Burkina Faso: improving zootechnical performance of local chickens by hybridization

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ABSTRACT

The traditional poultry farming in Burkina Faso uses low productive local strains. The purpose of this study was to improve local chicken's zootechnical performance by hybridization. In November 2013, 200 Isa Brown (IB) hens and 40 local cockerels were crossed and resulted after 7 days, to 980 eggs with an average weight of 53.60 ± 0.38 g. The eggs fertility rate was 18.3% and 75.0% for the third and tenth day respectively ($R^2 = 0.979$) while the hatching rate was 73.94 ± 3.69%. The hybridization allowed for a net gain of over 8.35 g body weight at hatching in relation to local chicks and breathed very significant dynamics of weight gain related to age ($R^2 = 0.997$). Meanwhile, the food intake of the first week (10.78 ± 4,10g/day/chick) is multiplied by 2.24 and 3.60 for the second and the third week respectively, after hatching. Hybridization has improved local chickens performance.

KEYWORDS : Burkina Faso, Hybridization, zootechnical performance, Local Hen, Isa Brown.

Introduction

Breeding and marketing of its products effectively contribute not only to ensure global food security but also to reach sustainable development in many countries of the world, especially in Latin America, Asia, and Sub-Saharan Africa (1). In Burkina Faso, a landlocked country in West Africa, livestock is the second largest exported item after cotton (2). In this country, poultry farming is one of the main activities of the industry with 35 million poultry heads (3). It is an important economic source. Unfortunately remaining traditional, very little care is provided to local poultry, as said Bisimwa (2003) (4), are rather "held" than "farmed." Annually, local, rustic hens lay 50 eggs on average, weighting less than 40 grams (5), while those of race give more than 300 eggs, weighting over 50 grams. Therefore, chicks from bred chickens are larger and have a higher probability of surviving. It would then be wise, through targeted crossing, to take advantage of the great mass of IB chicken eggs and transfer some of their development genes to local poultry to not only increase their body weight but also to increase their potential for spawning. The objectives of this research work includes: i) performing genetic crosses between local avian strains with imported IB poultry breeds; ii) estimating the parental reproductive performance; and iii) assessing the growth performance of hybrid chicks from 1 to 21 days of age.

Materials and methods

1. Materials

Poultry and food:

In November 2013, 200 chickens of about 8 months of age (average weight of 1,400 ± 90 g) and 40 local mature cockerels, with a black and white dominant phenotype (average weight 1,520 ± 170 g) were selected for crossing experiments. Reproducers as well as the chicks were fed respectively with the standard spawning diet and the standard food of the CNPA (New animal production center) laying chicks (Table 1).

Table 1: Composition of the experimental feed

	Spawning feed	Laying chicks feed
Dry matter (%)	90.00	88.83
Crude protein (%)	18.00	19.10
Fat matter (%)	5.15	4.57
MEn (kcal/kg)	2750	3111
Crude fiber (%)	4.10	3.62
Ca (%)	3.60	1.20
Av. phosphore (%)	0.45	0.77
Lysine (%)	0.86	1.13
Methionine (%)	0.43	0.64
Meth. + Cystine (%)	0.70	0.80

Foods were made from grains and their by-products, oilseed and by-products, oyster shells, mineral and vitamin supplements

Material

Were used: an enclosed chicken coop and two buildings (quarantine barn and rearing house) with latticed walls, a mixed electric incubator; a refrigerated room (about 17-18°C); an electric candler; an electronic weight and a wall thermometer.

2. Methods

Reception and preparation of experimental animals

IB hens come from poultry farms of the CNPA where a local prophylaxis layout and an adequate supply for modern farming are in force. The roosters were taken from local farmers and transported to the quarantine building, experimentation center of the CNPA, where for two weeks they have received a maximum of care (anti-stress, de-worming and vaccination against new castle disease). At the end of the quarantine, the 200 breed hens were equipped with 40 local roosters

Data Collection

Eggs were collected daily, weighed, placed in the cells, identified and kept cool (about 17-18°C) until incubation. At the exit of the hatcher, 93 chicks were weighed and placed into brooder, on a litter of about 10 cm at a room temperature of 33-35°C. Each day, the chicks were weighed, watered and fed at will.

Statistical analysis

Statistical analysis was performed with Epilnfo Version 6 and SPSS Version 17 softwares. P values ≤ 0.05 were considered significant.

Results

1. Reproductive performance

1.1. Spawn

During the first week of experimentation, despite the stress of the introduction of roosters in their building, the 200 hens have laid 980 eggs in seven days corresponding to an average rate of 70.00 ± 1.55% of lay, with an average egg weight of 53.60 ± 0.38 grams. Half (50.10%) of hens laid eggs between 7 am and 10 am. The data in Figure 1 shows that between 7 am and 6 pm, the temperature (T) of the henhouse, based on hours (H) of the day, had a progression-type polynomial with $R^2 = 0.990$. Always depending on the time of day, spawning (P) also was distributed according to a polynomial curve type ($R^2 = 0.993$) with a strong depression during the hot hours of the day (11 am to 3 pm).

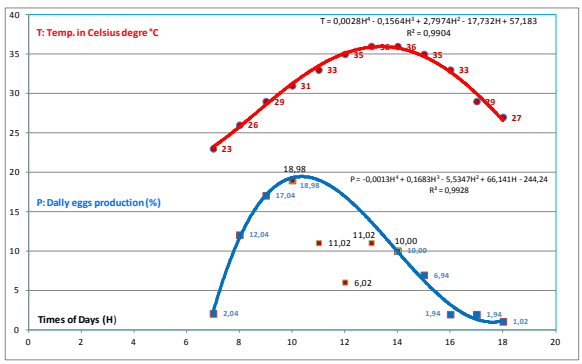

Figure 1: Daily distribution of laying in % of total eggs laid

1.2. Fertility of breed chicken eggs with local roosters

On the third day after the introduction of roosters, a low rate (18.3%) of laid eggs was fertilized. This rate increased gradually over time to reach 75.0% and 76.7% in the tenth to eleventh day after the introduction of roosters in hens. Thus, in days (D) after the introduction of local roosters in the IB hens' house, fecundity (F) of eggs has progressed with a logarithmic with $R^2 = 0,979$ (Figure 2).

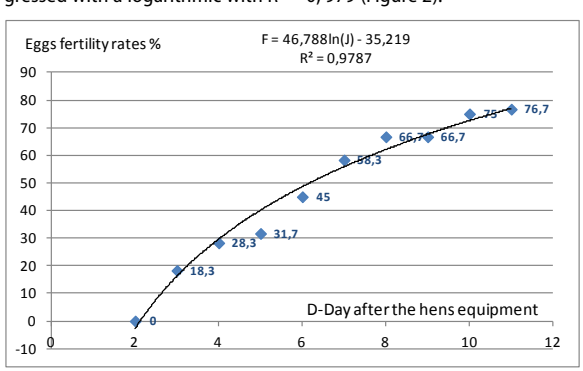

Figure 2: Fertility of eggs (% of incubated eggs) in the days of IB hens equipment with local roosters

1.3. Egg hatching rate

From 603 eggs put for hatching, 446 chicks hatched, giving a hatching rate of 73.94 ± 3.69% (Table II).

Table II: Egg hatching rate

Laying Day	Number of eggs	Number of chicks	Hatching rate (%)
1	153.00	118.00	77.12
2	152.00	113.00	74.34
3	149.00	108.00	72.48
4	149.00	107.00	71.81
Total	603.00	446.00	73.94
Mean			73.94±3.69

2. Hybrid chicks' growth performance

At hatching, 93 hybrid chicks had an average weight of 34.35 ± 0.37 g. Changes in body weight (BW), depending on the age in days (A) of hybrids, follows a polynomial curve with $R^2 = 0.997$ (Figure 3).

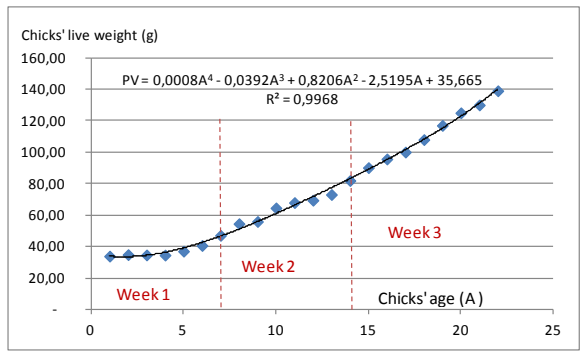

Figure 3: Weight evolution (g) of hybrid chicks according to their age (day)

The weight of the hybrid chicks averaged 37.63 ± 4.80 g, 66.83 ± 9.58 g and 109.42 ± 5.12 g respectively at weeks one, two and three. The values of the daily gain average (DGA) were 2.94 ± 3.05 g/d/subject (a week), 5.09 ± 3.36 g/d/subject (two weeks) and 6.97 ± 1.96 g/day/subject (three weeks). Between the first and the second week, there has been a sharp increase in food intake (+ 124%), which rose from 10.78 ± 4.10 g/d/s to 24.13 ± 5.33 g/d/s. This growth was lower (+ 37%) between two and three weeks where the birds have consumed 38.81 ± 3.95 g/d/s. However, food efficiency decreased (-9%) from the first (0.23 ± 0.19) to the second (0.21 ± 0.14) weeks. This decline has increased (-14%) between the second and third week (0.18 ± 0.05).

Discussion

Laying rate (70.00 ± 1.55%) in this study is similar to that of Benabdeljelil K. et al. (2003) (6) 68.8 to 71.06% for the IB hen. The local hen has laying levels well below those values. Indeed, in BF, by traditional farming, a local hen has an average laying rate of 12.3%, while in semi-intensive farming, the rate may reach 21.9% to 27.6% (7). In improved breeding with a systematic collection of eggs (8) reported a rate of 33.33% for local hens.

The eggs' weight of 53.64 g in this study, where the temperature remains high (> 29°C) from 9 am, is comparable to the weight of 53.72 g, 53.69 g and 54.32 g obtained by Brou et al. (1997) (9) for IB chicken eggs collected from 11 am where the temperature was also at 29°C. The increase in room temperature in breeding results from 30°C, in disturbances of acid-base balance and a drop in food consumption. The latter cause a reduction in egg production, weight and shell quality (10). However, the use of such young hens in this experiment was a definite advantage. Because according to Van Krimpen et al. (2014) (11), young laying hens have an ability to adapt to a wide range of environmental conditions. A statistically significant difference ($p < 0.05$) exists between the numbers of eggs collected from one collection hour to another after 11am (9). This could explain the phenomenon of variability with a depression of eggs laying in this experiment after 11 am.

The formation of the egg begins with the release of an egg (the yolk of the egg) from the ovary and then proceeds in several successive steps and takes about 25 hours. Fertilization takes place only if a sperm penetrates the egg within 20 min after ovulation. The probability that a hen is fertilized in the early hours of roosters introduction (day 1), plus the egg formation times, explains the low fertility rate (18.3%) at day 3 and its evolution after the roosters introduction.

The 73.9% of hatching rate indicates that more than 74% of the eggs were fertilized and the incubation conditions were good.

With the local chicken, the average chick weight which is 26 g which is lower than the weight of 34.35 ± 0.37 g of mixed race chicks. Thus, the current study has highlighted that the weight of day-old chicks that can be increased (8.35 g) by hybridization, for improved traditional livestock. In addition, the strong positive linear correlation ob-

tained (Figure 3) shows that between 1 and 21 days of life, the weight gain is strongly related to age of the hybrid chick with a daily weight gain dynamic and a very important food ingestion.

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The authors have declared that there is no conflict of interest.

REFERENCES

1 – FAO. (2011). World Livestock 2011 – Livestock in food security. Rome, Fao. | | | 2 – Ministère des Ressources Animales. (2000). Plan d'actions et programme d'investissements du secteur de l'élevage au Burkina Faso. Diagnostic, axes d'intervention et programmes prioritaires. 192 p. | | 3 – Ministère des Ressources Animales. (2010). Politique nationale de développement durable de l'élevage au Burkina Faso 2010-2025. 54 p. | | 4 – BISIMWA, C. (2003). Les principales races en aviculture. Troupeaux et Cultures des Tropiques, Dossier spécial volaille, 2003, 1, 4-8. | | 5 – Nianogo, A. J., Sanfo, R., Kondombo, S. D. & Neya, S. B. (1996). Le point sur les ressources génétiques en matière d'élevage au Burkina Faso. Animal genetic ressources information,17 : 11-28 | | 6 – Benabdeljelil, K., Lahbabi, S. & Bordas, A. (2003). Comparaison de croisements incluant une race locale ou une lignée expérimentale à un témoin commercial pour la production d'œufs au Maroc. Revue Élev. Méd. vét. Pays trop., 56 (3-4): 193-198 | | 7 – Projet de Développement de l'Aviculture Villageoise (PDAV). (1981). Rapport d'activité. Haute Volta 86p | | 8 – Ouedraogo, O. S. (2008). Essai d'amélioration génétique par croisement entre souche avicole locale exotique, mémoire d'ingénieur zootechnicien, Archive CNPA, No15. | | | 9 – Brou, G. K.G., Houndonougbo, F. M., Aboh, A. B., Mensah, G. A., & Fantodji, A. (2012). Effet de la variation temporelle de la température ambiante journalière sur le poids des œufs de poules pondeuses ISA Brown en Côte-d'Ivoire. Int. J. Biol. Chem. Sci. 6(5): 2158-2169. | | 10 – Travel, A., Nys, Y., & Lopes, E. (2010). Physiological and environmental factors affecting egg quality, INRA Productions Animales, 23 (2): 155-166; | | 11 – Van Krimpen, M. M., Binnendijk, G. P., Van den Anker, I., Heetkamp, M. J., Kwakkel, R. P., & Van den Brand, H. (2014). Effets de la température ambiante, la couverture de plumes, et le système de logement sur le partitionnement et la performance énergétique dans les poules pondeuses. J Anim Sci.; 92 (11): 5019-31. | |