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Baseline Characterization of Semen from Philippine Native Chickens: Banaba, Joloano and Paraoakan

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The study aimed to characterize and establish baseline data on the quantity and quality of fresh avian semen utilizing a sample of Philippine native roosters. Twenty-two heads each were acquired from breeds Banaba, Joloano, and Paraoakan. The baseline data analysis revealed significant variations in semen volume among different genetic groups, with Banaba displaying the highest volume, followed by Joloano and Paraoakan. Banaba also exhibited the highest semen pH value of 7.27 when compared to the other two genetic groups ($P < 0.05$). Across various genetic groups of native chickens, the majority of semen samples demonstrated a thick and creamy consistency and color (42.6%), followed by thin and creamy (32.9%), with a statistical significance of $P < 0.05$. Furthermore, variations in sperm concentration were observed among genetic groups, with Paraoakan having the highest sperm concentration, followed by Banaba and Joloano ($P < 0.05$). When the semen from Banaba and Joloano native roosters were extended in Ringer's solution, it exhibited good motility, with more than 50% of spermatozoa in motion, even after six hours of extension. In contrast, the pooled extended semen from Paraoakan native roosters displayed poor motility, particularly after eight hours of extension ($P < 0.05$). The study also showed that storage temperatures did not significantly affect all the sperm quality parameters of Banaba and Joloano. However, for Paraoakan, samples stored at low temperatures of 5 – 10°C had significantly higher percent motile and progressive sperm, and lower percent static sperm than those stored at room temperature (22 – 25°C) ($P < 0.05$).

Keywords: native, chicken, semen, Joloano, Banaba, Paraoakan

INTRODUCTION

The origin of the Philippine native chicken has been described by Lambio (1998) who suggested a high likelihood that it shares its lineage with the Red Junglefowl due to similar traits. As of October 2023, estimates from the Department of Agriculture - Bureau of Agricultural Statistics revealed that nearly 43% of the total chicken inventory in the Philippines consists of native and improved types primarily raised by smallholder farmers (PSA 2023). The native chicken business aids in local livelihood by providing food security and extra income, utilizing farm waste and by-products, and meeting other social and cultural obligations (DOST-PCAARRD 2020). Philippine native chickens are typically raised using free-range methods, although some are raised in a semi-confined environment. Most farmers prefer native chickens over exotic breeds due to their lower resource requirements, innate resilience in challenging environmental conditions, and capacity for reproduction even with minimal care and limited management. Native chickens are also known for their relative resistance to common poultry diseases, adept foraging abilities, and utilization of farm by-products. Their meat is highly sought after, boasting a unique flavor, leanness, natural pigmentation, and freedom from unwanted chemical residues, making it ideal for traditional Filipino dishes (Lambio 2000). Due to its establishment of a niche market, native chicken is in high demand. In markets, native chickens are either sold live or dressed. They are also mostly used for their meat and eggs, which are regarded as better and more reliable sources of protein. The market for native chicken is expanding because of customer preferences such as shifting towards organic and naturally-produced products (DOST-PCAARRD 2020).

The Philippines is home to several strains of native chickens, including the Banaba, Paraoakan, and Joloano (Lambio 1998; Lambio 2000; Lopez Jr. et al. 2013). Yan (2020) characterized the Banaba genetic group, which is primarily found in the Batangas area, where roosters with yellow-

reddish plumage, single combs, red earlobes, matching black tail and wing feathers, and unusually large heads. Female Banaba chickens exhibit a similar coloration to female red jungle fowls and often have spurs on their legs. Paraoakan native chickens are predominantly located on Palawan Island, particularly in the municipalities of Brooke's Point, Roxas, Puerto Princesa, San Rafael, Concepcion, Quezon, and Rizal. Paraoakan chickens feature reddish-black plumage with black tail feathers and white feathers at the base of the main tail. They are renowned for their deep bodies, upright posture, long legs, and gracefully curved necks. Male Paraoakan chickens possess rose combs, bright red earlobes, and wattles. Their upper beaks are horn-colored, while the lower beaks are yellow. Lastly, the Joloano chickens from Mindanao exhibit deep orange plumage, black tails with white spots, unadorned head features, and pea combs. Female Joloano chickens have pale brown plumage and pale yellow legs. Their sturdy, straight posture sets them apart, making them taller than many of their game-fowl counterparts.

However, several factors constantly pose imminent threats to the Philippine native chicken. These include climate change, the influx of exotic breeds of chicken, and the emergence of new avian diseases (Delos Santos et al. 2021). Thus, protecting these genetic materials and creating a Philippine native animal-centered conservation program is crucial.

Tarif et al. (2013) reiterated the importance of semen quality in semen cryopreservation and noted that the analysis of semen quality in poultry, as in other species, is necessary as it significantly affects artificial insemination and fertility. Characterization of semen and determination of the preferable storage temperature can be utilized in the succeeding steps through chicken semen cryopreservation, an essential tool for programs of genetic management and conservation. Hence, this study assessed and established baseline data on the fresh and extended semen characteristics of Banaba, Joloano, and Paraoakan native roosters.

MATERIALS AND METHODS

Rooster Samples and Housing Environment

A total of 66 roosters—22 heads each of Banaba, Joloano, and Paraoakan—were obtained from the Bureau of Animal Industry - National Swine and Poultry Research and Development Center (NSPRDC-BAI) at 1 mo of age. These roosters were housed at the University Animal Farm (UAF) of the University of the Philippines Los Baños, situated in Tuntungin, Los Banos, Laguna, Region IV-A, Philippines (14° 09'24.4'' N, 121° 15'06.6'' E). They were raised under a standardized feeding using commercially available feed and a 12-h lighting program and management system in compliance with established flock health programs instituted by the UAF. Each rooster was individually housed in a cage with a slightly elevated 2.0-ft^2 flooring and provided with commercial chicken breeding feeds. The roosters were kept in an open-sided housing system under typical farm conditions and prevailing environmental temperatures. The animals' weights were regularly monitored twice per month.

Semen Collection

Semen collection training started at 3 mo of age, which lasted for approximately 1 – 2 min, and was conducted daily for three consecutive weeks. Upon reaching 4.5 mo of age, the roosters underwent semen collection using the dorso-abdominal massage method (Burrows and Quinn 1935); by 25 mo of age, each of the genetic groups had a number of roosters that consistently produced ejaculates. Subsequently, semen collection became a routine procedure performed every other day, either at 7:00 or 9:00 AM. Each ejaculate was collected using a sanitized glass collecting funnel and carefully aspirated into a 1-cc sterile syringe (Terumo) without the needle. The samples were then placed in a clean foam-padded insulated box and promptly transported to the Animal Physiology Laboratory for evaluation about 1.1 km from the site (approximately 5 min of travel). The semen collection process spanned from June 2019 to February 2021, during which various parameters, including volume, pH, color, and consistency of ejaculates, were assessed. Volume was measured using the syringe's graduation, while pH was determined using pH strips (Macherey-Nagel). Color and consistency were evaluated, with ejaculates classified as thick creamy, thick white, thick yellowish, thin creamy, thin milky, thin yellowish, or watery (Capitan and Palad 1999). Before determining sperm concentration, individual ejaculates were pooled to ensure sufficient volume before drawing samples into the RBC dilution pipette (Desco). Sperm concentration (sperm/mL) was determined using a Neubauer (Hauser Scientific) chamber (Capitan and Palad 1999). At least 30 pooled ejaculates (Thélie et al. 2019) per genetic group of chickens were used to determine the sperm concentration.

Evaluation of Collected Semen Samples

Pooled ejaculates were extended with Ringer's solution (CIA Medical) at either a low temperature (5 – 10°C) or room temperature (22 – 25°C) and assessed using Computer-Assisted Semen Analysis (CASA Gene Pro). Semen quality parameters, such as motility (% motile, % progressive, and % slow) and morphology (% normal morphology, % bent tail, %coiled tail, and %DMR), were evaluated, except for Paraoakan, in which only %normal morphology and %total abnormal morphology were assessed since, at the time of data collection, other avian sperm morphology features in the software were not updated by the CASA manufacturer's technical representative. Due to the limited number of samples

that could be analyzed by CASA per day, sampling and data analysis were conducted independently for each genetic group of native chickens. For this study, 15 pooled ejaculates were collected from 18 Paraoakan roosters, 10 Banaba roosters, and 8 Joloano roosters. Sperm quality was assessed after 6 or 8 h. These data underwent statistical analyses using SAS on Demand for Academics (SAS Academics). Assumption testing involved Shapiro-Wilk's test for normality and Levene's test for homoscedasticity. For variables meeting both assumptions, ANOVA was applied, while the Friedman test was used for non-parametric analysis when assumptions were not met.

All procedures followed the recommendations of the Institutional Animal Care and Use Committee (IACUC) with assigned protocol number CAFS-2018-006.

Statistical Analysis

To provide an overall description of semen characteristics for the three genetic groups, descriptive statistics were employed, including averages, standard deviations, as well as minimum and maximum values for semen volume, pH, sperm cell concentration, and total (pooled) semen volume. To explore differences between genetic groups/breeds and age, data were categorized by genetic group and age groups (25 – 30 and 31 – 36 mo). These represented the age when all the genetic groups had a number of roosters that were consistently producing ejaculates. ANOVA was conducted using SAS On Demand, provided that the assumptions of normality and homogeneity of variance were met; otherwise, the Kruskal-Wallis test was used. The reported values represent least square means and SEM. For categorical variables like consistency and color, the Chi-square test of Independence was applied using SPSS v27 (IBM).

RESULTS

Out of the initial group of 66 roosters (Table 1), only 16 Banaba, 13 Joloano, and 14 Paraoakan roosters remained available for semen collection due to voluntary culling and losses from illness. While all roosters underwent successful training for semen collection, only 12 Banaba, 10 Joloano, and 18 Paraoakan roosters consistently produced ejaculates (Table 2). Semen collection was conducted every other day to ensure the quality of semen samples. A minimum of 150 ejaculates was collected from each genetic group (Table 3). Table 4 provides the respective maximum and minimum values for each parameter.

Analyzing individual collections (n = 153) from Banaba roosters aged 29 – 34 mo revealed that, on average, each collection yielded a semen volume of 0.17 ± 0.09 mL with a pH level of 7.28 ± 0.22, indicating a neutral pH. Additionally, when considering pooled semen per collection (n = 56) across different ages (ranging from 14 to 31 mo), the average total semen volume and sperm cell concentration were 0.83 ± 0.26 mL and 6.09 ± 2.96 x 10^9 cells/mL, respectively. It is noteworthy that the average sperm concentration of Banaba roosters exceeded that of Rhode Island Reds at 12 mo of age, which was reported as 4.03 x 10^9 cells/mL (Churchil et al. 2014).

Table 1. Number of animals acquired per species and genetic group.

Species	Genetic Group	No. of Heads
Chicken (*Gallus gallus*)	Banaba	22
	Joloano	22
	Paraoakan	22

Table 2. Number of ejaculates collected per species and genetic group.

Species	Genetic Group	Number of Semen Donors	Total no. of Ejaculates
Chicken (*Gallus gallus*)	Banaba	12	56
	Joloano	10	30
	Paraoakan	18	47

Table 3. Number of pooled ejaculates collected per species and genetic group.

Species	Genetic Group	Number of Semen Donors	Total no. of Pooled Ejaculates
Chicken (*Gallus gallus*)	Banaba	12	153
	Joloano	10	152
	Paraoakan	18	150

Table 4. Descriptive statistics of semen characteristics of Banana, Joloano and Paraoakan.

Genetic Group	Semen Volume (mL)	pH	Semen Concentration x10^9 cells/mL	Total Pooled Semen Volume (mL)
Banaba				
Min	0.02	6.80	2.48	0.32
Max	0.44	8.00	15.02	1.32
n	153	153	56	56
Joloano				
Min	0.01	6.00	1.23	0.40
Max	0.48	7.80	3.84	1.88
n	152	152	30	30
Paraoakan				
Min	0.01	6.40	2.60	0.04
Max	0.54	8.00	22.54	1.33
n	150	114	47	47

For Joloano roosters in the age range of 28 – 32 mo, the average semen volume from individual collections (totaling 152 collections) amounted to 0.13 ± 0.10 mL, displaying a neutral pH level of 7.15 ± 0.22. Looking at the average sperm concentration for this group across various ages (28 – 36 mo), it amounted to 2.75 ± 0.41 x 10^9 cells/mL, with an average total semen volume of 0.83 ± 0.26 mL. Notably, Joloano roosters proved more challenging to train and only began producing ejaculates at around 28 mo of age.

Using individual collection records (n = 150), the average semen volume collected from Paraoakan roosters aged 14 – 33 mo was 0.13 ± 0.10 mL, with a neutral pH of 7.10 ± 0.25. Assessing the average sperm concentration across ages ranging from 13 to 33 mo, it reached 10.99 ± 5.79 × 10^9 cells/mL, within a total volume of 0.48 ± 0.41 mL. In comparison, Tadondjou et al. (2014) noted a sperm concentration of 12.5 × 10^9 cells/mL for local barred roosters at 30 mo of age. Paraoakan's notably high sperm concentration, which can reach as high as 22.5 × 10^9 cells/mL, allows for its division into multiple doses, making it suitable for serving a substantial number of females. Semen volumes may be age-dependent—values were not significant in Thai native roosters 8 – 13 mo of age but tended to be lower in younger roosters (Chotesangasa 2001). Sonseeda et al. (2013) reported no difference in the ejaculatory volume of semen between 10 – 22 mo and 18 – 30 mo of age.

DISCUSSION

The study explored the effects of breed and age on the semen characteristics of native chickens. Upon analysis, breed was found to be significant only in pH but not in semen volume (Tables 5 and 6). Specifically, Banaba exhibited the highest semen pH value compared to the other two genetic groups. In terms of age, semen volume was higher in roosters aged 31 – 36 mo compared to those aged 25 – 30 mo, while semen pH values remained consistently neutral. Semen pH ranges from 6.7 to 7.0 (Mphaphati et al. 2016) but can be as high as 7.4 (Malik et al. 2013). Chickens that produce more semen volume had greater semen pH than those with less volume. Zhou et al. (2015) confirmed that semen pH is linked to various sperm quality attributes including volume, motility, viability, and concentration. Others reported individual semen volumes ranging from 0.2 to 0.4 mL in Venda cocks (Mphaphati et al. 2016) and as low as 0.10 mL in bantam chickens (Malik et al. 2013). According to Donoghue (1999), small-scale farmers commonly rely on simple methods, including the measurement of semen volume, in selecting roosters that are more likely to conduce to high fertility rates during mating. Research has shown that higher ejaculate volumes provide more room for sperm cells to move freely, which may consequently lead to greater sperm motility (Peters et al. 2008). Additionally, both the quality and quantity of semen are varied among specific breeds and varieties of chickens (Haunshi et al. 2011).

Table 5. LS Means ± SEM of collected semen volume and pH in three genetic groups of native chickens.

Genetic Group	Collected Semen Volume (mL[1])	pH***
Banaba	0.171 ± 0.02	7.27 ± 0.03[a]
Joloano	0.126 ± 0.02	7.15 ± 0.03[b]
Paraoakan	0.096 ± 0.02	7.10 ± 0.03[b]

[1]NS $P > 0.05$; ***$p < 0.001$; Different superscript letters within a column indicate significant differences ($P < 0.05$).

Table 6. LS Means ± SEM of collected semen volume and pH in two different age groups.

Age, mo	Collected Semen Volume (mL***)	pH[1]
25 – 30	0.120 ± 0.01[b]	7.17 ± 0.02
31 – 36	0.142 ± 0.01[a]	7.17 ± 0.02

[1]NS $p > 0.05$; ***$p < 0.001$; Different superscript letters within a column indicate significant differences ($P < 0.05$).

Examining consistency and color distribution across the three genetic groups of chickens (Table 7), majority of semen exhibited a thick and creamy consistency and color (42.6%) followed by a thin and creamy texture (32.9%). Statistical analysis using Chi-square results revealed a significant association between consistency and color with the genetic group in native chickens ($P < 0.0001$). For Banaba, a majority of its semen had a thin and creamy consistency (45.1%). In contrast, Joloano displayed a higher proportion of thick and creamy semen (76.3%) compared to Banaba and Paraokan. Paraoakan, while producing a majority of watery semen (39.0%), also had a substantial proportion of thin and creamy semen (34.4%), similar to Banaba. Notably, there were no observed instances of yellowish semen in native chickens. The presence of creamy-white colored semen observed in this study suggests that the massage technique utilized could be suitable for collecting high-quality chicken semen for artificial insemination (AI). This aligns with previous research by Peters et al. (2008) and Mothibedi et al. (2016), who both observed creamy-white semen specimens in specific chicken breeds such as the purebred naked neck Tswana and the black Nigerian indigenous naked neck cockerels, respectively. It is also worth noting that low sperm concentration as well as contaminants such as urine, feces, or blood may influence semen color (Machebe and Ezekwe 2006).

When considering age-related changes, the highest proportion of semen consistency and color was thick and creamy (Table 8). A significant association was observed between consistency and color and age ($P < 0.0001$). In roosters below 30 mo of age, the majority exhibited thin and creamy consistency and color (43.9%), followed by thick and creamy (33.8%). Conversely, for roosters aged 30 mo and older, a significantly higher proportion displayed thick and creamy semen (48.0%), followed by thin and creamy semen (26.0%).

Table 7. Frequency count (proportion, %) of semen consistency and color by genetic group of native roosters.

Consistency and Color	Genetic Group			Total
	Banaba	Joloano	Paraoakan	
Thick creamy	30 (19.6%)[b]	116 (76.3%)[a]	25 (26.0%)[b]	171 (42.6%)
Thick white	16 (10.5%)[a]	3 (2.0%)[b]	0 (0%)[b]	19 (4.7%)
Thin creamy	69 (45.1%)[a]	30 (19.7%)[b]	33 (34.4%)[a]	132 (32.9%)
Thin milky	16 (10.5%)[a]	0 (0%)[b]	0 (0%)[b]	16 (4.0%)
Watery	22 (14.4%)[b]	3 (2.0%)[c]	38 (39.6%)[a]	63 (15.7%)
Total	153 (100%)	152 (100%)	96 (100%)	401 (100%)

Chi-square test $P < 0.0001$. Different superscript letters within a row indicate significant differences ($P < 0.05$).

Table 8. Frequency count (proportion, %) of semen consistency and color by age of native roosters.

Consistency and Color	Age		Total
	25–30 mo	31–36 mo	
Thick creamy	53 (33.8%)[b]	118 (48.4%)[a]	171 (42.6%)
Thick white	3 (1.9%)[b]	16 (6.6%)[a]	19 (4.7%)
Thin creamy	69 (43.9%)[a]	63 (25.8%)[b]	132 (32.9%)
Thin milky	0 (0%)[a]	16 (6.6%)[b]	16 (4.0%)
Watery	32 (20.4%)[a]	31 (12.7%)[b]	63 (15.7%)
Total	157 (100%)	244 (100%)	401 (100%)

Chi-square test $P < 0.0001$. Different superscript letters within a row indicate significant differences ($P < 0.05$).

In terms of sperm concentration (Table 9), Paraoakan emerged with the highest sperm concentration among the three genetic groups, while Joloano exhibited the lowest sperm concentration. Poultry semen has a low volume at high concentration and contains about 4 – 6 billion spermatozoa/mL (Lewchalermvong et al. 2023). In the Thai native chicken, Khunkaew et al. (2021) reported a sperm concentration of 5.24 ± 0.58 billion sperm/mL. A higher sperm concentration is advantageous for downstream semen processing.

Lastly, the analysis in Table 10 revealed that sperm concentration did not differ significantly between age groups.

Sperm quality parameters were independently assessed over 6-h and 8-h intervals using CASA technology, using a total of 15 pooled ejaculates collected from native roosters of the Banaba, Joloano, and Paraoakan breeds. Following the motility criteria established by Capitan and Palad (1999), the extended semen pooled from Banaba and Joloano native roosters, when treated with Ringer's solution, displayed robust motility, with more than 50% of spermatozoa in motion, after 6 h. In contrast, the extended semen pooled from Paraoakan native roosters exhibited poor motility after being extended for 8 h.

Table 9. LS Means ± SEM of total pooled semen and sperm concentration in three genetic groups of native chickens.

Genetic Group	Total Pooled Semen volume, mL***	Sperm Concentration x10^9 cells per mL***
Banaba	0.86 ± 0.08[b]	6.83 ± 0.95[b]
Joloano	1.32 ± 0.10[a]	3.60 ± 1.20[c]
Paraoakan	0.22 ± 0.06[c]	10.48 ± 0.70[a]

***$p < 0.0001$; Different supercript letters within a column indicate significant differences ($P < 0.05$). Total pooled semen volume depends on the actual numbers of individual samples passing the pre-processing evaluation.

Table 10. LS Means ± SEM of total pooled semen and sperm concentration in two different age groups of native chickens.

Age, mo	Total Pooled Semen volume, mL[1]	Sperm Concentration x10^9 cells per mL[1]
25 – 30	0.76 ± 0.08	6.55 ± 1.00
31 – 36	0.84 ± 0.06	7.39 ± 0.69

The CASA evaluation of semen quality in Banaba native chickens, extended with Ringer's solution and stored at different temperatures for 6 h, is presented in Table 11. The results indicated that storage temperatures did not have a significant impact on any of the sperm quality parameters in Banaba native chickens. Similarly, the CASA assessment of sperm quality parameters in Joloano native chickens is presented in Table 12, which revealed no significant differences in any of the parameters at various storage temperatures.

Likewise, sperm quality in Paraoakan native chickens, extended with Ringer's solution and stored at different temperatures, was assessed through CASA. The results demonstrated that samples stored at lower temperatures exhibited significantly higher percentages of motile and progressive sperm, along with lower percentages of static sperm compared to those stored at room temperature (Table 13). Baseline data revealed variations in semen volume among genetic groups of roosters, with Banaba having the highest volume, followed by Joloano, and then Paraoakan. Additionally, it was observed that semen volume was higher in native roosters aged 31 – 36 mo compared to those aged 25 – 30 mo. Sperm concentration also varied among genetic groups, with Paraoakan having the highest sperm concentration, followed by Banaba and Joloano. Semen from Philippine native roosters exhibited predominantly thick, creamy to thick, and white color and consistency. CASA evaluations indicated that semen samples from these animals consistently displayed very good to excellent motility.

Table 11. LS Means ± SEM of CASA-evaluated qualities of semen from Banaba native chickens extended with Ringer's solution at different storage temperatures and observed after 6 h.

	Sperm Quality Parameters						
Temperature	% Motile	% Slow	% Progressive	% Nomal Morphology	% Bent Tail	% Coiled Tail	% DMR
Room (n = 15)	73.12 ± 2.25	58.06 ± 1.69	6.96 ± 0.82	88.03 ± 3.23	10.88 ± 3.11	0.41 ± 0.13	0.45 ± 0.11
Low (n = 15)	72.77 ± 2.25	59.17 ± 1.69	6.97 ± 0.82	88.89 ± 3.23	10.00 ± 3.11	0.36 ± 0.13	0.55 ± 0.11
p-value	0.889	0.634	0.833	0.852	0.710	0.783	1.000

Table 12. LS Means ± SEM of CASA-evaluated qualities of semen from Joloano native chickens extended with Ringer's solution at different storage temperatures and observed after 6h.

	Sperm Quality Parameters						
Temperature	% Motile	% Slow	% Progressive	% Nomal Morphology	% Bent Tail	% Coiled Tail	% DMR
Room (n = 15)	59.86 ± 2.81	46.75 ± 1.55	6.79 ± 0.90	88.48 ± 2.57	8.83 ± 2.51	0.34 ± 0.10	0.92 ± 0.14
Low (n = 15)	61.43 ± 2.81	47.39 ± 1.55	6.87 ± 0.90	90.77 ± 2.57	7.70 ± 2.51	0.26 ± 0.10	0.89 ± 0.14
p-value	0.614	0.924	0.733	0.071	0.071	0.366	0.782

Table 13. LS Means ± SEM of CASA-evaluated qualities of semen from Paraoakan native chickens extended with Ringer's solution at different storage temperatures and observed after 8 h.

	Sperm Quality Parameters				
Temperature	% Motile	% Progressive	% Slow	% Static	% Normal Morphology
Room (n = 14)	32.85 ± 4.58	6.73 ± 1.60	21.56 ± 2.44	67.15 ± 4.57	97.25 ± 1.78
Low (n = 14)	43.93 ± 4.58	13.98 ± 1.60	22.58 ± 2.44	56.08 ± 4.57	97.38 ± 1.78
p-value	0.0331*	0.0075*	0.712	0.0332*	0.317

*$p \leq 0.05$, significant

CONCLUSION

The baseline data showed that semen volume varied among genetic groups of roosters, with Banaba having the highest volume, followed by Joloano, then Paraoakan. Higher semen volume was also observed in the 31st – 36th mo of native roosters compared to the 25th – 30th mo. In terms of sperm concentration, Paraoakan showed the highest value, followed by Banaba, then Joloano. Philippine native roosters' semen color and consistency are predominantly thick, creamy, or thick white. The CASA evaluation showed that semen samples exhibited very good to excellent motility.

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