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SPERM QUALITY PARAMETERS IN MEXICAN HAIRLESS BOARS FROM YUCATAN

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Abstract: The objective of the work was to evaluate the spermatic quality in Pelon Mexicano boars from Yucatan. Three boars of said genotype were used, which were trained to mount a dummy. The study variables were: macroscopic and microscopic characteristics, semen motility kinetic parameters, and testicular characteristics. A total of 42 seminal samples were evaluated, the results were analyzed with descriptive statistics, cluster analysis, correlation and linear regression with the STATGRAPHICS Centurión XV Version 15.2.06 ® program. The odor was normal, average volume 76.81mL and milky color. Individual motility, sperm concentration, morphology, vitality, and acrosomal integrity were: 80.24%, 237.54 X106 esp/ml, 94.71%, 85.62%, and 99.40%, respectively; while the curvilinear speed, rectilinear speed, average speed, linearity index, straightness index, oscillation index, lateral displacement of the head, and crossing frequency, were: 75.81mm/s, 40.24 mm/s, 57.05 mm/ s, 52.46%, 68.75%, 73.65%, 2.45 mm/s, and 7.93 Hz, respectively. A relationship was found between the variables of concentration, volume and motility ($P \leq 0.001$), likewise, it was observed that the collection weeks significantly affected the variables of concentration, morphology, motility and vitality ($P \leq 0.01$). The 1815SG stallion presented the highest values for all the testicular variables evaluated, keeping a direct relationship with a greater volume and sperm concentration. Finally, with the cluster analysis, for acrosomal integrity (99.57%), volume (122ml) and sperm concentration ($390x10^6$esp/ml), the best semen quality parameters corresponded again to the 1815SG stallion. The semen evaluation techniques used guarantee greater precision and reliability in the evaluation of semen quality in Pelón Mexicano boars from Yucatán.

Keywords: seminal quality, criollo pig, genetic conservation.

INTRODUCTION

The Food and Agriculture Organization of the United Nations (FAO 2010) has proposed the World Plan of Action on Animal Genetic Resources, which includes 33 strategic priorities, including the fight against genetic erosion, the sustainable use of these resources and their contribution to the millennium goals: 1) Eradicate extreme poverty and 2) Ensure environmental sustainability. Locally adapted pig species, due to their great genetic diversity, could help conserve characteristics of greater value such as hardiness, resistance to diseases and obtaining products with quality characteristics to satisfy a preferential market (Sierra et al., 2016).

Latin America has a great diversity of animal genetic resources, which are used in different production systems and under different ecological and social conditions; Part of these resources have unique characteristics and suffer genetic dilution or extinction (Segura and Montes, 2001). Among these resources is the Pelón Mexicano pig (CPM), a genotype of special importance, since it is threatened due to the deliberate crossing that has been carried out with other breeds (Lemus, 2008; Hernández et al., 2020).

These pigs have important economic characteristics, they are raised in rural communities under low-tech conditions, taking advantage of tubers, forages and agricultural by-products, although it is currently produced commercially (Hernández et al., 2020). In order to guarantee the conservation of animal diversity, as a local genetic patrimony, there are a series of measures that can be applied, based on experiences that have occurred in other countries that have suffered the disappearance of their genetic resources. The semen evaluation in the CPM of Yucatan, candidates for stallions is very important to avoid infertility problems, because there are environmental, nutritional, sanitary factors and zootechnical management that affect the semen quality.

There are techniques for semen evaluation that are routinely used in swine production, since they are fast and provide information on the structure and functionality of the sperm (Almaguer, 2015). Likewise, the technique based on computerized semen analysis systems (CASA), this yields results objectively and facilitates the determination of new variables with diagnostic value in each species and a critical reading of the results, as well as the fertilizing potential. of the semen evaluated (Restrepo et al., 2013). In this sense, the main objective of this work was to evaluate the sperm quality in ejaculates of Pelón Mexicano boars in Yucatán, in order to select future breeders that contribute to the recovery of this genotype.

MATERIALS AND METHODS

STUDY AREA

The field work and the seminal evaluation were carried out at the Tecnológico Nacional de México Campus Conkal, in the "La Curve" research area, located in the municipality of Conkal, Yucatán (Mexico) at 20° 29' N and 89° 39 ' Or, at 8.0 meters above sea level, Awo-type climate, which is characterized by being warm subhumid, rainfall of 850 mm and an average annual temperature of 25.5°C, according to the Köppen classification modified by García (2004).

STUDY ANIMALS

Three candidate pigs for studs of the Mexican hairless genotype were used and, considering that it is an endangered breed, it is particularly difficult to obtain specimens that meet the phenotypic characteristics reported for these animals (Sierra et al., 2016; Estupiñán et al., 2020). The specimens came from herds belonging to cooperating producers established in the interior of the State of Yucatán (Table 1), said pigs were previously trained to mount the dummy for a period of 60 days.

ORIGIN	EARRING	AGE (months)
Sierra Papacal	0415JC	31
Rancho San Antonio, Cansahcab	1115VC	32
Hacienda Teya	1815SG	29

Table 1. Mexican Hairless Pigs used in semen evaluation

GENERAL MANAGEMENT

The pigs were housed in individual pens measuring 3.60 x 4.00 m under a gallery with a zinc sheet roof; each one had automatic drinkers and individual feeders with a capacity of 4 kg. They were fed once a day at a rate of 1 kg of food with 13 % CP and 3,210 kcal/kg of ME.

SEED COLLECTION

The gloved hand technique was used (Hancock and Howell, 1959) and once ejaculation started, only the rich fraction was collected in a thermos with a plastic bag inside and covered with sterile gauze to filter the gel from the ejaculation. ejaculated (Arlegui, 2006). A total of 14 samples were collected for each stallion with intervals between mounting (work rate) of seven days. Eight samples were obtained from the same ejaculate for analysis using the Computerized Semen Analysis System (CASA).

STUDY VARIABLES

MACROSCOPIC CHARACTERISTICS

The amount of ejaculate collected was measured directly in a graduated cylinder in (ml) (CIVEQ).

The color was evaluated according to the characteristics that the ejaculate must present such as: milky white, creamy white and opalescent.

The smell of the ejaculates was perceived directly in the collection bag immediately after obtaining it. The odor was considered normal through tests of the evaluator's previous experience, determining whether or not it was characteristic.

MICROSCOPIC CHARACTERISTICS

Mass motility was determined by taking a drop of undiluted semen and placed on a slide tempered at 37°C in a Platen (SBS-MAGNETIC STIRRER) and subjectively observed the speed of movement of the eddies on a scale from 0-4 with the 10 X objective of the optical microscope (Optika-Italiano).

To estimate individual or progressive motility, a drop of pure semen was placed on a slide with coverslips tempered at 37°C on a slide (SBS-MAGNETIC STIRRER) and, observed in three different fields to give a final reading, evaluated. the progressive movement of the spermatozoa with the objective of 40X in an optical microscope (Optika-Italian) considering values from 1 to 100 and the result was expressed as a percentage.

For sperm concentration of semen, it was diluted in a 1:100 ratio in saline solution, previously prepared in 1 liter of distilled water mixed with 10 ml of formalin, 9 g of sodium chloride and 0.3 g of methylene blue, of which a 10 ml test tube with 100 µl of semen was used (Hancock, 1959). For cell counting, the Neubauer chamber was filled with the diluted sample and subsequently observed with the 40X objective. The concentration was obtained using the following formula:

$$\text{sperm concentration ml}^{-1} = \text{Number of sperm counted x dilution factor}(5X10^{6}).$$

For vitality analysis, an eosin-nigrosin stained smear was used. The stained spermatozoa were considered dead due to damage to the membrane, on the contrary, those not colored were considered alive; for its calculation, 100 cells were taken, obtaining the percentage of alive and the percentage of dead (Hancock, 1959).

In the analysis of sperm abnormalities, a smear with eosin-nigrosin staining was used, using three slides; the first was used to deposit a drop of semen and one of dye (eosin-nigrosin), the other was used to mix both drops, and in the third the scanning technique was practiced, it was allowed to dry and 100 cells were counted with the 100 X objective using a drop of immersion oil on the smear for greater visibility, detecting normal and abnormal spermatozoa, these results were expressed as a percentage.

For the state of the acrosome, a saline solution was used, previously prepared in 1 liter of distilled water mixed with 10 ml of formaldehyde, of which 1 ml was used in a test tube with 25 μl of semen. For the cell count, a drop was placed on a slide and with coverslips using a drop of immersion oil and observed in a bright field microscope at 100X, we proceeded to identify the acrosome of the spermatozoa, taking into account the spermatozoa. that present the apical crest smooth and entire as intact (FCF). 100 cells were counted and the result was expressed as a percentage (Bane, 1961).

KINETIC PARAMETERS

The following kinetic parameters were analyzed in each sample: VCL, curvilinear velocity (μm/s); VSL, rectilinear speed (μm/s); VAP, mean speed (μm/s); LIN, linearity index (VSL/VCL%); SRT, straightness index (VSL/VAP%); WOB, swing index (VAP/VCL%); ALH, amplitude of the lateral displacement of the head (μm) and BCF, frequency of crossings (Hz). These were analyzed with the CASA System (Hamilton Thorne, CEROS Sperm Analyzer model), for which a 5μl drop of diluted semen was considered in the double cell chamber (Makler) tempered at 37°C and a cover was placed on it. special object (Abaigar et al., 1999).

TESTICULAR MEASUREMENTS

Testicular measurements related to scrotal circumference and lengths were considered, since there is a relationship between the largest size and seminal volume and concentration (Schulze et al., 2020). For this, a metallic Vernier caliper was used, as well as an extendable tape measure.

STATISTIC ANALYSIS

The following mathematical model was used:

$$Yij = \mu + Di + \epsilon ij$$

Donde:

Yij=Variable de estudio

μ=Media poblacional

Di= Efecto del i-ésimo semental

Єij=error residual

The data obtained were analyzed using descriptive statistics, in addition, a multiple correlation and linear regression analysis was performed, as well as a multivariate analysis. All the aforementioned analyzes were processed with the statistical program STATGRAPHICS Centurion XV Version 15.2.06 (Statpoint, Inc, 2007).

ETHICS

Ethics, care, welfare and management of pigs followed the guidelines of the official Mexican standards: NOM-062-ZOO-1999 and NOM-051-ZOO-1995. In addition, the experiment was carried out following the good livestock practices approved by the Technological Institute of Conkal, Yucatán in 2019, this study is part of a final report of postgraduate studies.

RESULTS AND DISCUSSION

The results in the variables of color and odor are presented in Figures 1 and 2, where a milky color of 45.24% and normal odor of 88.10% were obtained in the total of the ejaculates, results that agree with what was reported by Rugeles et al. to the. (2013) in the Pietran breed, who obtained a milky white color and normal odor, indicating that there is no abnormality in their accessory glands and no contamination with urine.

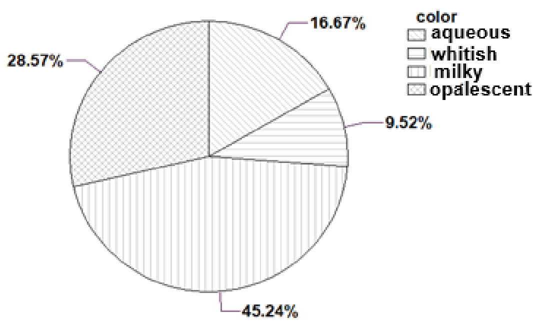

Figure 1. Color of ejaculates in Mexican Hairless boars from YucatánFigure 1. Color of ejaculates in Mexican Hairless boars from Yucatán

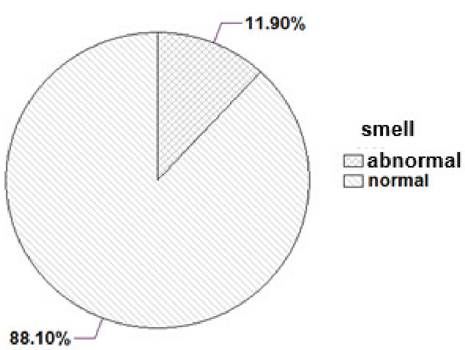

Figure 2. Odor of the ejaculates in Pelón Mexicano boars from YucatánFigure 2. Odor of the ejaculates in Pelón Mexicano boars from Yucatán

Table 2 shows the average values of the seminal characteristics of the total ejaculates evaluated. An average value of semen volume of 76.8 ml was observed, with a value interval of 15 to 155 ml, demonstrating that there is a wide variability between ejaculates, different from what Chan et al. found. (2015), with a value interval of 40 to 80 ml and an average of 55.81 ml; Regarding the variables of motility, concentration, morphology and vitality, these authors obtained values of 76.33%, 258.58x106 sp/mL-1, 97.87% and 83.73%, respectively, results that are very similar to those obtained in the present work. On the other hand, Sierra et al. (2005), in CPM evaluated a total of 30 ejaculates, and obtained for the variables of volume, sperm concentration, motility, morphology, and acrosome integrity, 53.24ml, 270.97x106, 80.39%, 94.53% and 99.14%, respectively. results also similar to those of the present study except for the volume. Masenya et al. (2011) in a comparative study on the characteristics of semen from Kolbroek and Large White pigs, obtained an average volume of 140 and 170 ml, respectively, and for the characteristics of concentration, motility, sperm morphology and vitality in these two breeds, values of 0.727 and 0.761 x 10^9 esp/mL, 95% and 91%, 84% and 82%, 84.6% and 81.7%, respectively, concluding that these sperm characteristics of both Kolbroek and Large White are similar to each other, but the sperm concentration of the Kolbroek indigenous people is higher than what was obtained in the present study. Lopez et al. (2012) mention that, for reproductive purposes in Artificial Insemination (AI), it is recommended that boars present a minimum quality of 80% in normal morphology and 70% motility; It is worth mentioning that, in CPM, higher percentages were obtained for these parameters, which indicates that this genotype has a sperm quality that could serve as a reference to be applied in reproduction programs.

Figure 3 shows the results for mass motility, obtaining a score of 4 (64.29%), considered good for reproduction as mentioned by Peinado et al. (1998), who suggest that acceptable levels for this variable go from 3 onwards, on a subjective scale from 0 to 5, with 5 being the highest rating. In this sense, Chan et al. (2015) found a score of 4 in mass

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Variables	n	Media	D.E.	C.V. (%)	Minimum	Maximum
Volume (ml)	42	76.81	38.83	50.56	15	155
Vitality (%)	42	85.62	13.31	15.55	28	99
Motility I (%)	42	80.24	10.70	13.34	60	100
Concentration E x10^6	42	237.54	189.83	79.92	9	745
Morphology (%)	42	94.71	5.85	6.18	78	100
I acrosomes (%)	42	99.40	0.94	0.94	97	100

Table 2. Descriptive statistics of sperm quality in Mexican hairless boars from Yucatan.

Motility I=Individual motility (%), Concentration E=sperm concentration (x10^6), I acrosomes=integrity of acrosomes (%).

	n	Half	D.E.	C.V. (%)	Minimum	Maximum
ALH	24	2.45	0.51	20.80	1.66	4.14
BCF	24	7.93	1.10	13.92	3.62	9.7
LIN	24	52.46	8.25	15.74	30.67	63.93
MI	24	76.83	16.96	22.07	16.63	93.03
MP	24	51.20	15.38	30.03	9.79	68.99
STR	24	68.75	6.88	10.01	51.23	77.19
VAP	24	57.05	14.97	26.25	18.55	85.05
VCL	24	75.81	17.70	23.35	32.19	110.61
VSL	24	40.24	11.19	27.81	11.37	69.62
WOB	24	73.65	6.51	8.84	54.94	83.41

Table 3. Descriptive statistics of seminal motility

MI=individual motility, MP= progressive motility, VCL= curvilinear velocity (µm/sec), VSL= rectilinear velocity (µm/sec), VAP=average velocity (µm/sec), LIN=linearity index (%), STR =straightness index (%), WOB= oscillation index (%), ALH=lateral head displacement (µm), BCF=crossover frequency (Hz).

variables	Volume	Vitality	individual motility	Concentration spermatic	Morphology	Integrity acrosomal
Volume						
Vitality	0.27 *					
Motility Individual	0.71 ***	0.48 ***				
Concentration spermatic	0.50 ***	0.34 *	0.62 ***			
Morphology	-0.63 n. s.	-0.17 n. s.	-0.36 n. s.	-0.19 n. s.		
Integrity Acrosomal	-0.01 n. s.	0.19 n. s.	0.12 n. s.	0.04 n. s.	-0.04 n. s.	

Table 4. Linear correlation between different semen quality characteristics in Pelón de Yucatán boars

Vitality (%), Volume (ml), Individual motility (%), Sperm concentration (x10^6 sp/ml), Acrosomal integrity (%). *=($p<0.05$).

motility in CPM, a result similar to that of this study.

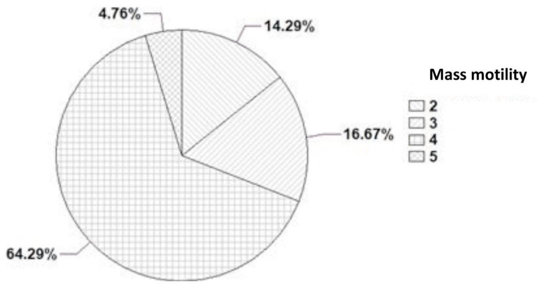

Figure 3. Mass motility of ejaculates in Pelón Mexicano boars from Yucatán

Table 3 shows the results of the descriptive statistics for the motility parameters evaluated using the CASA system. A straightness index (STR) of 68.75% was identified, considered as a slow movement for this parameter according to Hernández et al. (2013). Masenya et al. (2011) in a comparative study on semen characteristics in Kolbroek (South African indigenous breed) and Large White pigs using the CASA system, obtained the following results for each breed, respectively: VCL (143.3μm/s and 129.1μm/s), VSL (40.9 μm/s and 32.8μm/s), VAP (90.6μm/s and 81.1μm/s), LIN (29.2% and 25.7%), STR (45.8% and 41.2%) and WOB (64.4% and 62.6%), being the VCL and the VAP higher than those obtained in the present work. In the same sense, Fraser et al. (2001) found the following results in 40 ejaculates from Polish Landrace boars: VSL(53.3 μm/s), VAP (58.5μm/s), VCL(80.8μm/s), LIN (66.3%), STR (91.0%), ALH (2.3μm) and BCF (11.0μm), being generally similar to those reported in the present work, differing only in STR, since said authors reported 91%. For their part, Valverde et al. (2018) in a study to determine sperm motility in four racial groups (Duroc, Yorkshire, Landrace and Pietrain), found that the breeds with the highest LIN were Pietrain and Yorkshire (52.79% and 51.23%, respectively), similar to those obtained in this work; while for the Landrace and Duroc breeds the WOB values (63.52% and 63.48% respectively) are higher than those of the present study. Valverde et al. (2018) indicate the importance in reproductive terms that the VSL and the LIN and STR indices have, since high values in these parameters may be responsible for transport through the female genital tract, since a greater rectilinear speed allows spermatozoa to better fertilize the oocyte; Regarding parameters such as ALH, it is considered an important motility parameter that is required in the penetration of the fertilization barriers that surround the oocyte, such as the zona pellucida, and the BCF that will allow estimating changes in the mobility of the flagellum.

Table 4 shows the relationship between the different characteristics of semen quality evaluated with the conventional method. A highly significant relationship was found between the variables: individual volume and motility ($P \leq 0.001$), sperm volume and concentration ($P \leq 0.001$), motility and concentration ($P \leq 0.001$), and motility with vitality ($P \leq 0.001$), these relationships They are of great importance in porcine reproduction since for AI purposes it is important to select the player with the highest sperm volume and concentration and, even better, with good motility and vitality.

It must be noted that there are not enough studies that measure the relationship between the different variables of sperm quality in the CPM. Although some authors have evaluated the relationship between sperm quality parameters with some variation factors such as: climate, time or season of the year, age, racial type and nutritional status (Henao et al., 2004; Rocha et al., 2005 and Velasquez, 2013).

Table 5 shows the linear correlation between the kinetic motility parameters obtained using the CASA system. The results show a high association between progressive motility (MP) and individual motility (MI) (r= 0.78), as well as between the linearity index (LIN) and the straightness index (STR) (r= 0.92). This is because they are parameters of the same type. This result agrees with what was reported by Quintero and Rubio (2008), who mention that the LIN provides an indication of the relationship between the straight trajectory traveled and that in situations where the average trajectory approaches to the trajectory in a straight line, a higher STR is presented. Likewise, Bravo et al. (2011) report a high association between BCF and ALH in cattle (r= 0.675, P<0.01), which when the beat frequency increases also increases the amplitude of the lateral displacement, contrary to what was obtained in this work where these two parameters had a low relationship (r=0.13, n.s). In this study, a negative relationship was found between ALH and LIN, STR, and WOB, which indicates that the greater the lateral displacement of the head, the less progressive and linear the spermatozoa are, similar to what was reported by Bravo et al. (2011).

Figure 4 shows the linear regression analysis of sperm morphology and ejaculation week. Where one of the stallions evaluated presented a negative trend in terms of the presence of abnormal sperm cells as the collection period progressed, while the others improved their trend from 95% to 100% and from 85% to 95% of normal cells., which indicates that for both stallions the number of collections did not affect the seminal morphology.

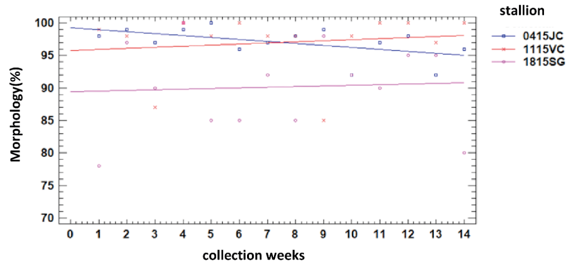

Figure 4. Regression analysis between morphology and weeks of collection

Figure 5 presents the linear regression analysis of individual motility according to the weeks of semen collections. In general, an increasing trend can be seen for the three stallions evaluated, being notably greater in the case of stallion 1815SG. However, the remaining stallions present acceptable values to a certain extent, as demonstrated by Acosta (2005) in CC21 (Cuban swine breed) and Yorkshire pigs, who found motility of 74.67% and. 77.40%, respectively, which are similar to those found in this study.

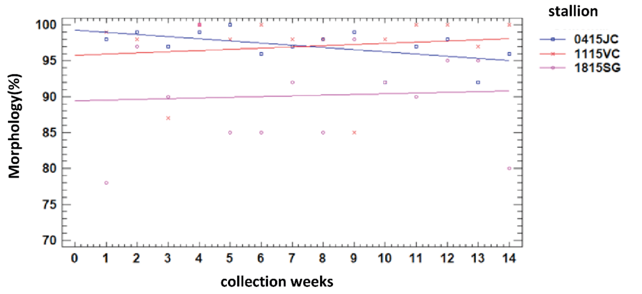

Figure 5. Regression analysis between individual motility and collection weeks

In the linear regression of vitality and the weeks of semen collection, a positive trend can be seen in the three stallions evaluated as the days of collection elapsed (Figure 6), with this we can confirm the relationship between the variables of sperm motility and vitality. In addition, an important variation between stallions is observed, in which the stallion 0415JC presented a more pronounced behavior, going from 65% to 86% of vitality.

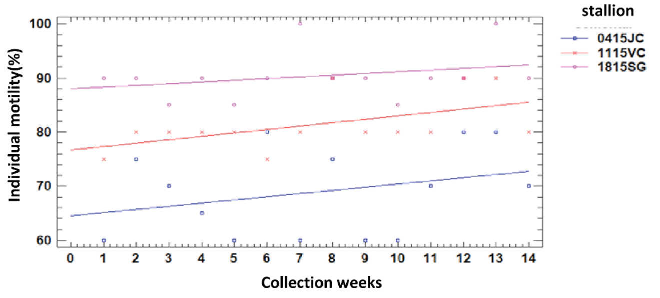

Figure 6. Regression analysis between vitality and collection weeks

	ALH	BCF	LIN	MI	MP	STR	VAP	VCL	VSL	WOB
ALH										
BCF	0.13 n. s.									
LIN	-0.56 n. s.	0.57 **								
MI	0.11 n. s.	0.78 ***	0.46 *							
MP	-0.31 n. s.	0.75 ***	0.87 ***	0.78 ***						
STR	-0.67 n.s.	0.43 *	0.92 ***	0.24 n. s.	0.78 ***					
VAP	0.52 **	0.63 **	0.17 n. s.	0.62 **	0.28 n. s.	-0.13 n. s.				
VCL	0.85 ***	0.46 *	-0.20 n. s	0.42 *	-0.00 n. s.	-0.44 *	0.88 ***			
VSL	0.17 n. s.	0.80 ***	0.60 **	0.62 **	0.61 **	0.38 n. s.	0.85 ***	0.61 **		
WOB	-0.39 n. s.	0.59 **	0.85 ***	0.68 **	0.78 ***	0.59 **	0.50 **	0.08 n. s.	0.71 ***	

Table 5. Linear correlation between different kinetic parameters of motility.

MI=mass motility, MP=progressive motility, VCL=curvilinear velocity (µm/sec), VSL=rectilinear velocity (µm/sec), VAP=mean velocity (µm/sec), LIN=linearity index (%), STR = straightness index (%), WOB = oscillation index (%), ALH = lateral head offset (µm), BCF = crosstalk frequency (Hz). *=(p<0.05)

Conglomerate	Acrosomal integrity	Sperm concentration	Morphology	individual motility	Vitality	Volume
1	98.60	75.30	97.80	65.00	57.20	49.80
2	99.81	156.56	97.75	74.69	87.38	44.88
3	98.92	384.04	95.62	89.23	91.38	102.31
4	99.88	262.81	85.25	86.25	90.50	116.13

Table 6. Cluster Analysis of the mean values of semen quality

Vitality (%), Volume (ml) Individual motility (%), Sperm concentration (x106 sp/ml), Acrosomal integrity (%).

In general, it can be seen that in most of the regressions the seminal quality variables were not affected by the duration and intervals of collections, so we can say that time did not influence these parameters, however, it has been verified that the decrease in the interval of days between collections (intervals of three days), decreases the seminal volume, this being an important factor to take into account when it comes to males destined for AI (Rocha et al., 2005).

In the case of the regressions in the variables volume and acrosome integrity, the 1815SG stallion presented the best values, while in the rest of the stallions an opposite behavior was presented in both variables.

Figure 7 shows the histogram of the cluster analysis for the total number of ejaculates evaluated, which could be classified according to four groups of seminal quality.

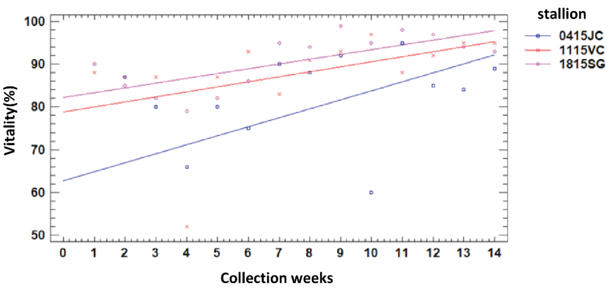

Figure 7. Cluster Analysis of semen quality

In the same sense, Table 6 shows the average values of the parameters mentioned in Figure 7. Group one includes the lowest values for sperm quality, while group three was the one that obtained the highest results. adequate that denote a good seminal quality in the CPM of Yucatan.

Table 7 shows the percentage of ejaculates from each stallion evaluated, and its distribution among the groups formed in the cluster analysis. Group three was the one that obtained the best average values for the different semen quality characteristics considered, the stallion 1815SG stands out, who participated with 57% of his ejaculates in this group, which corresponds to 8 of 14 ejaculates, before this we can affirm that this stallion can be recommended to be used as a future breeder.

Table 8 shows the testicular measurements of each stallion, as well as the average values obtained for each evaluated semen quality variable. The 1815SG stallion presented the highest values for all the variables evaluated, except for morphology (90.14%), these results are directly related to the scrotal circumference and length where the 1815SG stallion was once again superior to the rest. These results agree with what was reported by Milán et al. (2013) who observed in pigs of the CC21 x L35 genotype that when the testicular size increased, so did the volume of the ejaculate, they also point out that the larger the testicular size, there is an increase in sperm concentration and, as a consequence, in the number of seminal doses obtained, this is due to the fact that the increase in the diameter and length of the seminiferous tubules favors a greater sperm production and seminal volume. Also Allrich et al. (1981) in commercial pigs point out that the volume of the ejaculate and sperm production are a function of the capacity and available space provided by testicular development.

	Boars		
Variables (average values)	0415JC	1115VC	1815SG
scrotal semicircumference (cm)	20	18.5	24.5
Right length (cm)	18	19	22
Left length (cm)	19.5	21	23
Volume (ml)	48.00	59.57	122.86
Motility I (%)	68.93	81.43	90.36
Concentration x10^6 (sp/ml)	103.14	219.46	390.00
Vitality (%)	78.50	87.71	90.64
Acrosomes I (%)	99.29	99.36	99.57
Morphology (%)	97.00	97.00	90.14

Table 8. Testicular measurements and semen quality characteristics in Pelón boars from Yucatán

CONCLUSIONS

Conventional semen evaluation, simultaneously with the Computerized Semen Analysis System, in addition to considering the testicular characteristics of the stallions evaluated, guarantee greater precision and reliability in the evaluation of semen quality in Pelon Mexicano boars from Yucatan.

According to the results obtained, a variation between stallions was found, which suggests that the individual semen evaluation serves as a parameter to confirm an existing variability in this genotype, a situation that did not affect the semen quality in the breed. The use of at least one stallion (1815SG) is recommended, which met the semen quality characteristics for its multiplication in the population.

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