Sahel Journal of Life Sciences FUDMA (SAJOLS)
March 2025 Vol. 3(1): 8-15
ISSN: 3027-0456 (Print)
ISSN: 1595-5915(Online)
DOI: *https://doi.org/10.33003/sajols-2025-0301-02*

Research Article

Assessment of Semen Quality in Local Chicken Strains and Amo Cocks Influenced by *Moringa oleifera* Extract in Semi-Arid Areas

***Musa Garba SALISU[1], Aminu Goniwa BOBBO[1], Abdulrahman Muhammad BARDE[2], Munnir Mukhtar GETSO[3], Alhassan Musa HASSAN[4], Nafisa MUHAMMAD[5] and Abba Ibrahim BUKAR[2]**

[1]Department of Animal Science, Modibbo Adama University Yola, Adamawa State
[2]Department of Animal Science, Federal University Dutse, Jigawa State
[3]Department of Animal Science, Kaduna State University (KASU), Kaduna State
[4]Department of Animal Science, Aliko Dangote University of Science and Technology Wudil, Kano State
[5]Department of Animal Science, Bayero University Kano, Kano State
****Corresponding Author's email*: musagarbababah@gmail.com**

ABSTRACT

This research was aimed at assessing the semen quality traits of village chicken strains and Amo cocks under the influence of Moringa leaf extracts in a Semi-Arid environment. The research was conducted at the veterinary clinic of the Department of Animal Science, Modibbo Adama University Yola. Sixty sexually matured cocks from five (5) different phenotypes (smooth multicolour, dwarf, frizzle, naked neck and Amo cockerel) were used in the study. The cocks were orally administered with Moringa leaf extracts and semen was collected before and after the administration of the extracts. The cocks were allotted to treatments 1, 2, 3, 4 and 5 based on their phenotypes characteristics and each treatment was replicated 12 times in a Completely Randomized design (CRD). According to the results of the study, Naked neck (NN) was recorded with the highest (70.41) percentage of motile sperm cells, sperm density (678.00) and sperm count (2.99), whereas frizzle (FR) had the highest value of viable sperm cells (81.25) and pH mean value of 6.91, respectfully. The P-value of 0.559 suggests that the observed differences in semen quality are not statistically significant among the tested phenotypes. It was recommended that Moringa leaf extracts do not have deleterious effects on semen quality parameters.

Keywords: Amo Cocks; Chickens; *Moringa oleifera;* Semen

Citation: Salisu, M.B., Bobbo, A.G., Barde, A.M., Getso, M.M., Hassan, A.M., Muhammad, N. & Bukar, A.I. (2025). Assessment of Semen Quality in Local Chicken Strains and Amo Cocks Influenced by *Moringa oleifera* Extract in Semi-Arid Areas. *Sahel Journal of Life Sciences FUDMA*, 3(1): 8-15. DOI: *https://doi.org/10.33003/sajols-2025-0301-02*

INTRODUCTION

The reproductive performance of the male is an essential economic trait in the management of breeder stock and the evaluation of ejaculation is an important aspect of determination of the reproductive status of male animals (Nwoko and Ibe, 2005). The popularity of poultry has many advantages over other livestock because genetic improvement could be attended at a faster rate rather than most farm animals since they have a shorter generation interval, males can produce semen as early as 12 weeks of age, depending upon the size, however sperm from such roosters is rarely viable and effective maturity does not develop until birds are around a minimum of 18 weeks of age (Leeson, 2009; Summer. 2009). Reproductive performance is usually expressed in terms of semen yield and quality in cocks. According to Rumbullaku and Agostini (2007), this includes viability, morphology, motility, volume, concentration, density and pH. Normal values of semen concentration ($200x10^6$), semen motility (50%) or more with rapid forward progression and semen pH (6.8-7.0). The assessment of the seminal characteristics of the

fowl gives an excellent indication of reproductive capacity of an animal.

Moringa oliefera belongs to the order Brassicalis and the family Moraceae (Mgbemena and Obodo, 2016). It is called -Zogale in Hausa-Ewe ilel among Fulanis and Okwenoyibol in Igbo (Olagbemide and Philips, 2014). *Moringa*'s natural properties can increase sperm count and moringa can help with sperm production of minerals like iron, calcium and zinc are all present in moringa, these minerals are major factors in the connection between moringa and sperm production. Research into the reproductive action of *M*. *oleifera* shows that it enhances male sexual function including libido, and improves sperm quality and anti-erectile dysfunction among many others.

MATERIALS AND METHODS

The Study Area

The experiment was conducted at the veterinary clinic of the Department of Animal Science, Faculty of Agriculture, Modibbo Adama University Yola, Adamawa State. It lies between latitude 9°N and 14^0N and longitude 12°E and 38^0E and it covers an area of about 3420 hectares. The temperature of the area is high throughout the year, a maximum temperature of about 42°C has been observed with minimum temperature ranges between 26.9°C and 27.8°C.

Experimental Animals, Feeding and Routine Management

Sixty sexually matured cocks from each of five different phenotypes namely, smooth multicolour, dwarf, frizzle, naked neck and Amo cockerel were used in the study. The ages of the birds range between 40 to 45 weeks weighing, between 1.8-2.0kg. The cocks were purchased from good sources within Adamawa state. They were allowed to acclimatize for one week before the commencement of the study. The cocks were placed on a commercial feed of 110-160 grams daily, water was provided *adlibtum* throughout the experiment, similarly, they were also been treated against ecto and endo parasites and oral coccidiostats were administered. The cocks were managed intensively throughout the study period which lasted for 6 weeks. The cocks were housed on a battery cage system (52x45x38cm). 16-hour light per day was maintained throughout the research. Before the commencement of the extract administration, all the cocks were identified and tagged.

Plant Collection and Identification

Moringa oleifera leaf were harvested from house hold farms, gardens, and fences in Jahun local government area, Jigawa state. It was shade dried in an open air room at room temperature for 5 days. The leaves of the plants were grounded thoroughly to fine powder and stored in clean jute bags until tested

Semen Collection

Semen samples were collected from each cock before the oral administration of the extract to serve as baseline samples. Similarly, Semen samples were collected on days 3, 7 and 14 at 7 am daily throughout the collection period. Immediately after collection, the ejaculates were placed in lacted ringer solution at a temperature of 29-30^0c to the laboratory for semen evaluation. All necessary measures were taken to avoid exposure of the semen to any unfavourable conditions during and after collection to minimize the chances of faecal contamination of the semen as recommended by Kalamah *et al*. (2002), feed was removed late afternoon before the semen collection. Semen collection and evaluation were performed at room temperature.

Semen Evaluation

Sperm Motility evaluation

A small drop of normal saline solution was placed with the aid of a micropipette on a clean glass slide warmed at 38^0C with a clean glass rod, a very small drop of whole semen on the buffer, and a coverslip was placed upon the drop, allowing it to occupy all the space under the coverslip, but not flood out beyond it. The sperm motility was estimated by microscopic observation at 400x magnification. Motility was expressed as the percentage of motile spermatozoa with moderate to rapid progressive movement.

Mass activity

In evaluating mass activity, a drop of undiluted semen was placed on a slide without cover slip and examined under compound microscope (100x) and scored into 1-5 scales (1+=no perceptible motion, 2+=few spermatozoa move without forming any waves, 3+=small slow-moving waves, 4+=vigorous movement with moderately rapid wave and eddies and 5+=dense, rapidly moving waves and eddies)

Sperm concentration

The sperm concentration was measured using the direct cell count method. Here, a haemocytometer (Improved Neubauer counting chamber) was used for counting sperm cells as described by (Baker *et al.,* 1985). For the final result, the concentration of sperm per volume will be found using the formula:

Formula: Sperm Concentration =N×DF×106A×D

Where;

N is the number of cells

DF the dilution factor

A is the area of chamber counted = $0.002mm^2$

D is the depth of chamber = 0.1mm (Baker, *et al*., 1985)

Total sperm count = sperm concentration x total volume of ejaculate ($x10^9$) (Hafez, 1985)

Sperm morphological evaluation

Using slide prepared for the Dead-Alive evaluation, sperm cells were counted 100 under light dry magnification and the number of sperm that have normal and abnormal morphologies were expressed in percentages.

Experimental design

Sixty sexually matured cocks at the aged of 40-45 weeks of age were equally allocated to five treatment groups and each treatment was replicated 12 times in a Completely Randomized design (CRD). The five treatment groups were T1, T2, T3, T4 and T5. Each cork was administered with 500mg of *Moringa* leaf extract orally at once. Semen samples were collected in all the treatments before the commencement of the oral administration as the baseline samples for comparison.

Statistical Analysis

The data generated was analysed using a statistical program (SPSS, version 17). One-way analysis of variance (ANOVA) was carried out to find out significant differences means separation was carried out using the DUNCAN Multiple Range Test where significant difference exists.

RESULTS

Semen Quality Traits of Different Phenotypes of Village Chickens and Amo Cockerel

Table 1 shows a comparison of semen quality characteristics among different chicken phenotypes treated with *Moringa* leaf extract. The result indicated that there were no variations in semen quality characteristics among the different phenotypes. In terms of motility (Fig. 1), Naked Neck (NN) phenotypes exhibited the highest mean value (70.41±6.04), followed by Frizzle (FR) (66.25±5.11), Dwarf (DW) (59.16±8.18), Smooth Multi-coloured (SM) (58.33±8.24), and Amo Cockerel (53.75±6.06). For viability (Fig. 2), the Frizzle (FR) phenotype had the highest mean value (81.25±2.9), the semen morphology (Fig. 3) of the naked neck phenotype had the highest value of 83.33±3.44 also naked neck had the highest mean value for sperm density and sperm count of 678.00±51.42 and 2.99±0.35, respectively. More so, Amo cockerel had the lowest mean value of motility and morphology of 53.75±6.06 and 63.75±5.60, respectively. Frizzle phenotypes were recorded with the highest pH (Fig. 4) of 6.91±0.05 which nearly neutral. The phenotypes showed variations in the different semen quality characteristics assessed. The p-value of 0.559 suggests that the observed differences in semen quality characteristics among the phenotypes are not statistically significant. This means that the impact of Moringa leaves extract on semen quality characteristics does not differ significantly among the tested phenotypes. These measurements serve as indicators of semen quality in the respective chicken phenotypes as indicated in Table 1.

DISCUSSION

The study shows the beneficial effects of *Moringa* leaf extract on semen quality characteristics of different phenotypes of village chickens and Amo cockerel, all the parameters do not ($p<0.05$) differ significantly across the treatment groups and these variations could be attributed to their phenotypes background. This study agreed with the finding of Ogunsola *et al.* (2017) who suggested that the consumption of *Moringa* leaf increases reproduction function in males as evidenced by the increase in the level of reproductive hormones that help in sperm cell production and maturation. This result conforms with the report of Oleye *et al.* (1997) who recorded an increase in the percentage of live sperm from 65.74% to 78.52% and a corresponding decrease in the percentage of dead sperm cells from 1379% to 12.46%. In this study, the protective effects of *Moringa* leaf may be attributed to the presence of phytoconstituents (phenol, tannins, anthocyanin, glycosides) that scavenge free radicals, activate the antioxidants enzymes and inhibit oxidases (Amin, 2005; Liu, 2006) the phenolic present in *Moringa* leaf extract can terminate the radical chain reaction by converting free radicals to more stable products in addition to the phenolics, which serve as antioxidants and may effectively scavenge various reactive oxygen species and free radicals under in vivo conditions. This result is not in harmony with the findings of Awodele *et al*. (2012) who reported a decrease in sperm count following *Moringa oleifera* administration in rams. Sperm morphology is an indicator of some disorders in spermatogenesis. According to Anderson (2001), partial or complete degeneration of the sperm tubules may result to high production of abnormal spermatozoa thereby reducing the proportion of normal spermatozoa resulting in the loss of membrane integrity following peroxidation in the vas deferens (Alkan *et al.,* 2001) attributed sperm abnormalities to it relatively long and slender mid-piece of chicken sperm cell which make it vulnerable to damage. *Moringa oleifera* contain fundamental antioxidant and phenolic compounds that helps in protecting the testis against morphologic, spermatogenic and oxidative changes brought about by toxic materials and certain antineplastic agents (Siddhuraju and Becker, 2003; Saalu *et al.*, 2011).

These findings align with the study conducted by Awoniyi *et al.* (2020), which investigated the effect of *Moringa* leaf extracts on semen quality characteristics

in chickens. Although the study did not find significant differences among the phenotypes, it highlighted the potential positive impact of *Moringa* leaf on overall semen quality characteristics. Awoniyi *et al.* (2020) also investigated the effect of *Moringa* leaf extracts on semen quality characteristics in village chickens. They reported that the motility, viability, morphology, pH, sperm count, and sperm density were influenced by the application of *Moringa* leaf extracts. The study found that *Moringa* leaf extracts had a positive impact on semen quality characteristics in the tested chicken phenotypes.

CONCLUSION

The study reveals that *Moringa oleifera* leaf extract appears to be consumed by poultry without detrimental effect on the semen parameters, it can therefore be judiciously utilized.

Based on the findings and discussion of the topic, here are some recommendations:

i. *Moringa* leaf extracts can be used as it doesn't have deleterious effects on semen profile

ii. Future studies should consider assessing other reproductive parameters, such as fertility and hatchability rates, to gain a comprehensive understanding of the overall reproductive health and potential of village chicken populations.

REFERENCES

Alkan, Z., Hawkes, W. C., & Wong, K. (2009). Selenium supplementation does not affect testicular selenium status or semen quality in North American men. *Journal of Andrology*, *30*(5), 525-533.

Amin Afshar, M., Jahanbin, R., Yazdanshenas, P., Mohammadi Sangcheshmeh, A., Varnaseri, H., Chamani, M. & Bakhtiyarizadeh, M. R. (2015). Effect of zinc nano-complex on bull semen quality after freeze-thawing process. *Animal Production*, *17*(2), 371-380.

Anderson, D. J., Politch, J. A., Mayer, K. H., Welles, S. L., O'BRIEN, W. X., Chong, X. U., Bowman, F. P., & (2012). Highly active antiretroviral therapy does not completely suppress HIV in semen of sexually active HIV-infected men who have sex with men. *AIDS (London, England)*, *26*(12), 1535.

Anderson, R. E., Hanson, H. A., Lowrance, W. T., Redshaw, J., Oottamasathien, S., Schaeffer, A. & Hotaling, J. M. (2017). Childhood cancer risk in the siblings and cousins of men with poor semen quality. *The Journal of urology*, *197*(3), 898-905.

Awoniyi, T. A., Yusuf, A., Akande, F. A., Jibril, A., & Dauda, H. Y. (2020). Effect of Moringa leaf extract on semen quality characteristics of village chickens and exotic cockerels. Journal of Animal Science, 98(Supplement_3), 20-21.

Baker, M. C., & Cunningham, M. A. (1985). The biology of bird-song dialects. *Behavioral and Brain Sciences*, *8*(1), 85-100.

Kalamah, M.A.A.; M.M. El-Nady; F.H. Abdou., E.K. Esa (2002). Effect of heat stress and vitamin C on some productive traits and Physiological aspects in chickens. Minufiya Agric. Res., 27:57 – 74.

Leeson, S., Bongalhardo, D. C., & Buhr, M. M. (2009). Dietary lipids differentially affect membranes from different areas of rooster sperm. *Poultry Science*, *88*(5), 1060-1069.

Liu, J., Chaveiro, A., Engel, B., Critser, J. K., & Woelders, H. (2006). Significant variability among bulls in the sperm membrane permeability for water and glycerol: Possible implications for semen freezing protocols for individual males. *Cryobiology*, *53*(3), 349-359.

Mgbemena, N. M., & Obodo, G. A. (2016). Comparative Analysis of Proximate and mineral composition of Moringa oleifera root, leaves and seed obtained in Okigwe Imo State, Nigeria. *Journal of Molecular Study Medical Res*ources *1*(2), 57-62.

Nwoko, N., & Ibe, S. N. (2005). Effects of breeds and season on semen quality and fertility of bucks in a humid tropical environment. *Nigerian Journal of Animal Production*, *32*(2), 327-341.

Ogunsola, O. A., Owolabi, J. O., Fabiyi, O. S., Nwobi, N. L., Faluyi, B., & Akinbola, A. S. (2017). Moringa plant parts consumption had effects on reproductive functions in male and female rat models. *Journal of Dental and Medical Sciences*, *16*, 82-86.

Olagbemide, P. T., & Philip, C. N. A. (2014). Proximate analysis and chemical composition of raw and defatted Moringa oleifera kernel. *Advances in Life Science and Technology*, *24*, 92-99.

Rumbullaku L, Agostini. (2007). Semen analysis. 8th Post-Graduate course for training in Reproductive Medicine and Reproductive Biology. Department of Obstetrics and Gynaecology. Geneva University Hospital;.

Saalu, L. C., Osinubi, A. A., Akinbami, A. A., Yama, O. E., Oyewopo, A. O., & Enaibe, B. U. (2011). Moringa oleifera Lamarck (drustick) leaf extract modulates the evidences of hydroxyurea-induced testicular derangement.

Siddhuraju, P., & Becker, K. (2003). Antioxidant properties of various solvent extracts of total phenolic constituents from three different agro climatic origins of drumstick tree (Moringa oleifera *Lam.) leaves. Journal of agricultural and food chemistry, 51(8), 2144-2155.*

Table 1: Semen Quality Characteristics of Different phenotypes of Village chickens and Amo cockerel

Phenotypes	Semen Quality characteristics									
	Motility (%)			Viability (%)	Morphology (%)	pH	Semen Count (10^6)	semen Density	Overall Mean	P-Value
	Active	Slow	Non-Motile							
FR	66.25±5.11	20.83±3.46	12.92±3.74	58.75±3.74	81.25±2.95	6.91±0.05	2.76±0.31	667.87±52.15	111.68±22.55	0.559
NN	70.41±6.04	18.33±2.97	11.25±4.61	65.83±5.89	83.33±3.44	6.75±0.09	2.99±0.35	678.00±51.42	117.11±22.85	
DW	59.16±8.18	17.5±2.34	22.50±7.67	55.00±7.22	76.25±3.20	6.70±0.11	2.67±0.45	552.58±73.93	99.04±20.02	
SM	58.33±8.24	20.83±3.52	20.83±8.23	55.41±7.86	68.33±5.68	6.62±0.10	2.05±0.25	591.58±47.66	103.00±20.02	
AC	53.75±6.06	23.75±5.11	22.50±4.28	55.83±5.60	63.75±5.60	6.69±0.06	2.51±0.30	605.83±57.01	104.32±20.78	
Overall Mean	61.58±3.05	20.25±1.59	18.00±2.60	58.16±2.70	74.58±2.11	6.75±0.04	2.60±0.15	610.16±25.47	107.63±9.47	

Note: Values are presented as mean ± standard Error of the Mean (SEM)

Key FR = Frizzle, NN= Naked neck, DW= Dwarf, S M=Smooth multi-coloured, AC=Amo Cockerel

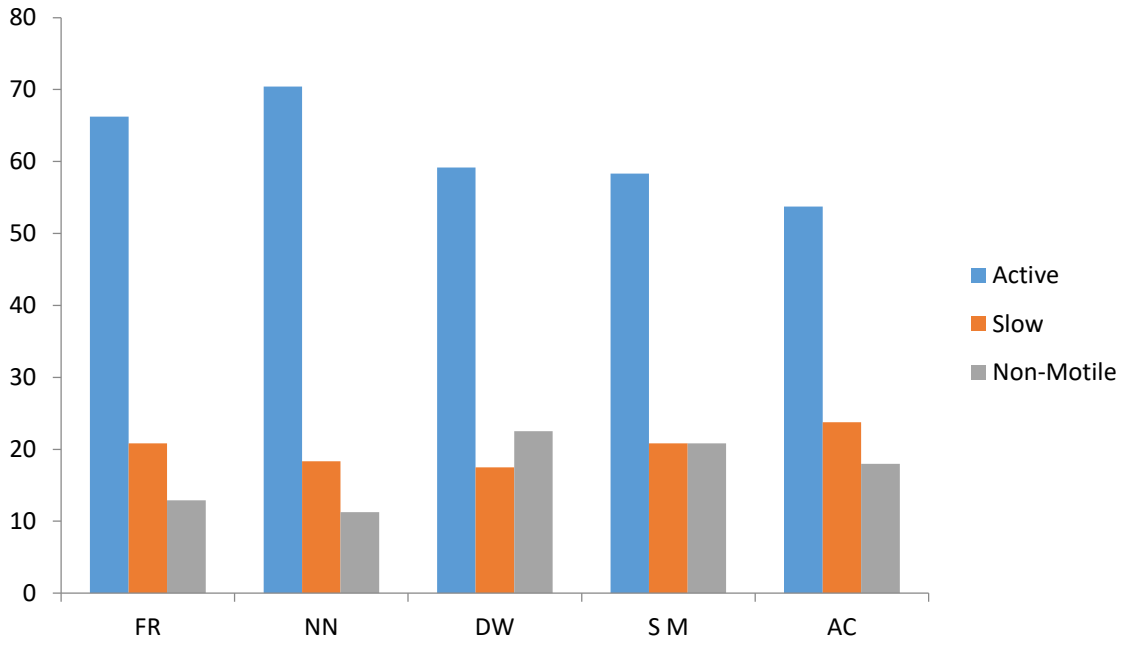

Fig. 1: semen Motility

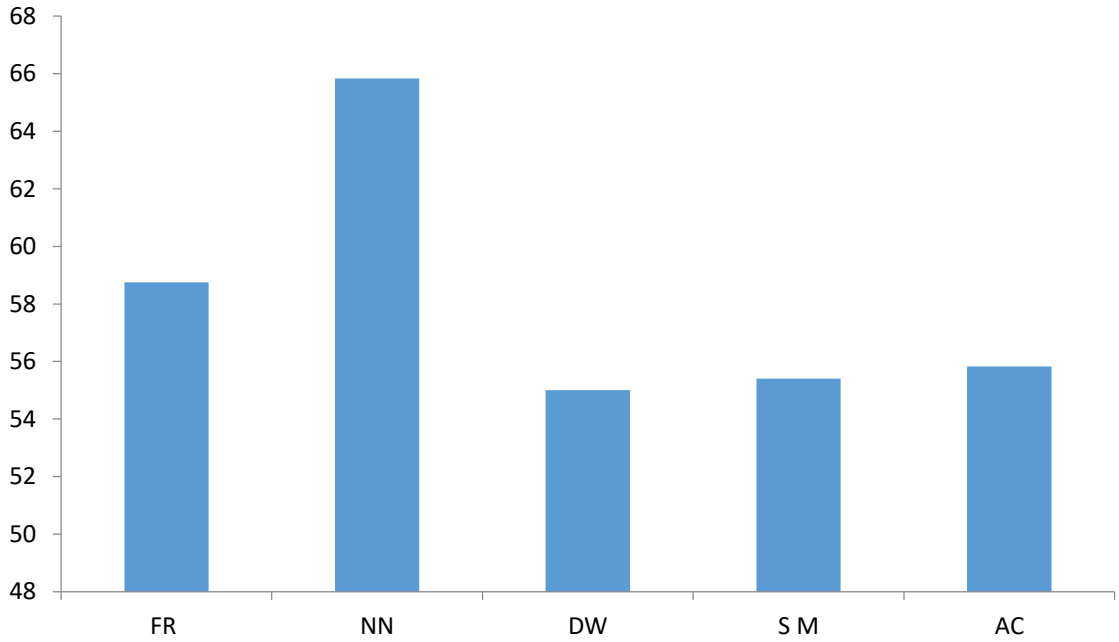

Fig. 2: Semen Viability

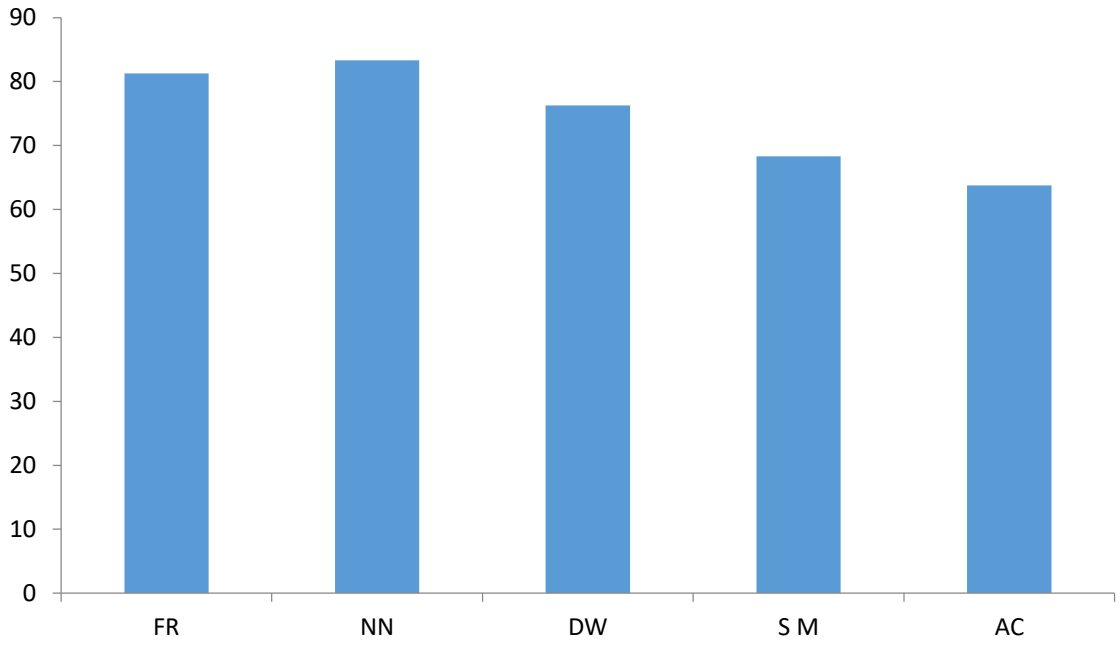

Fig. 3: Semen Morphology

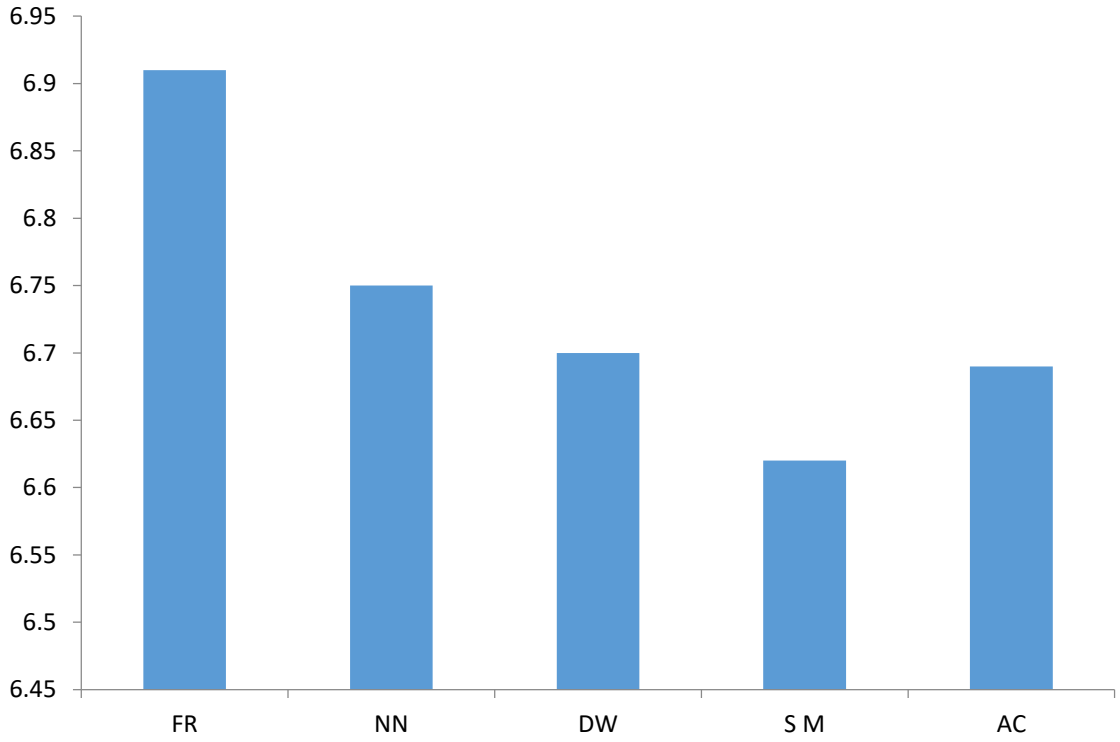

Fig. 4: Semen pH

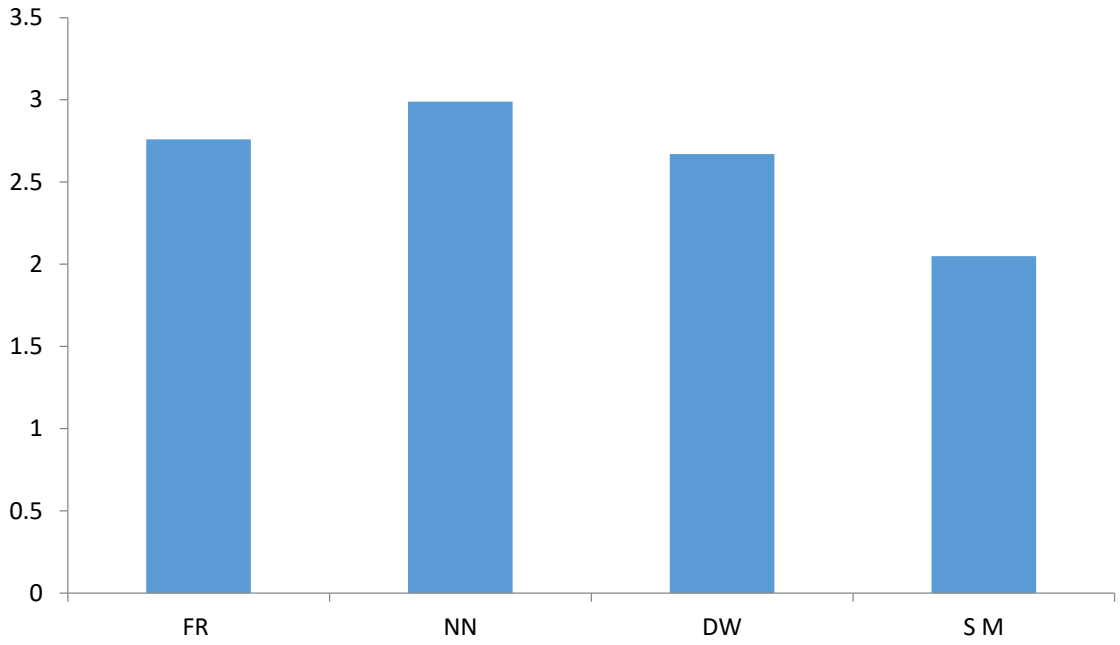

Fig. 5: Semen Count

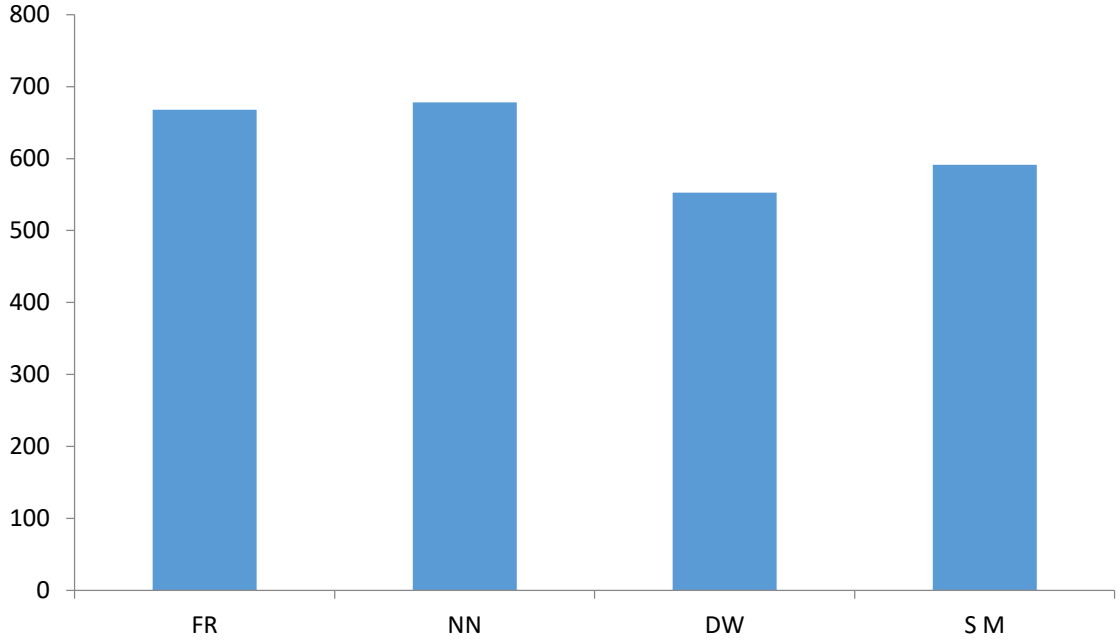

Fig. 6: Semen Density