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Using Commercial Cryopreservation of Dromedary Camel Semen Using Tris-Based Extenders (T-BE), Free-From and Enriched With Egg Yolks

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Abstract

Using commercial Tris-based extenders, the effectiveness of cryopreserving Semen from seven adult dromedary camels using both eggs yolk-supplemented and egg yolk-free methods were compared in this study. Control was provided via the SHOTOR camel-specific extension. AndroMed, OPTIXcell, Triladyl, Steridyl, SHOTOR, and Triladyl were employed to assess and dilute the collected semen samples. Before liquid nitrogen freezing, the dilute Two hours were spent progressively cooling and balancing the Semen. Using computer-assisted sperm analysis, the DNA fragmentation, anomalies, plasma membrane integrity, kinetics, vitality, and motility of the Semen were assessed both before and following freeze-thaw cycles. Progressively active sperm during the pre-freezing examination was greater in samples diluted with SHOTOR in data diluted with Steridyl, OPTIXcell, or AndroMed.Additionally, SHOTOR and Triladyl produced sperm with much higher viability and integrity of DNA than any other diluent, whereas Triladyl had sperm with significantly higher plasma membrane integrity. Triladyl significantly increased sperm motility in the post-thawing examination as opposed to SHOTOR, Steridyl, or AndroMed, with OPTIXcell as the lowest effective. The use of Triladyl produced the highest level of progressive sperm motility. AndroMed and Triladyl created the highest sperm velocities in curved, straight, and average routes after thawing, respectively. Triladyl generated sperm with the highest coefficients of linearity and straightness, while SHOTOR produced sperm with the greatest DNA and cell membrane integrity. Steridyl was less effective than Triladyl, while OPTIXcell and AndroMed led to subpar sperm quality after freezing viability. With OPTIXcell, the rate of aberrant sperm was highest.In contrast, SHOTOR or Triladyl had the lowest rate—however, the greatest sperm quality after Triladyl, SHOTOR, and semen cryopreservation provided thawing. Steridyl, AndroMed, and OPTIXcell are further viable treatments. Our research shows that Triladyl is currently the best commercially available extender for cryopreserving dromedary camel's Semen.

Keywords: Triladyl, Steridyl, AndroMed, OPTIXcell, SHOTOR, and Semen.

Introduction

The livestock business has seen many advancements because of artificial insemination (AI), notably in selecting for and enhancing genetically related features [1]. As AI overcomes time- and space-related constraints, freezing Semen is a prerequisite for widespread deployment. With the emergence of a global semen trade, the use of AI in bovine has significantly expanded. As of now, there are numerous difficulties connected to various stages of sperm management, storage, and collecting are all examples of AI in camelids.

Liquid diluent buffers called semen extenders also include protecting chemicals. They are essential for safeguarding Semen and evaluating the efficiency of cryopreservation techniques [2]. As a result, many attempts to determine the finest several animal species,

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notably the family Camelidae, have semen extenders. For cattle and horses, these efforts resulted in the development of numerous commercial semen extenders. In contrast, for camelids, only two particular SHOTOR and the Green Buffer semen extenders have been developed. Bactrian camel's sperm that has been refrigerated or frozen, along with dromedary camel's sperm, have been successfully preserved by SHOTOR.

Green buffer has also successfully kept frozen dromedary camel semen from deteriorating [3]. The extenders, however, have not demonstrated realistic in vivo fertility rates, and the key factor determining their effectiveness is post-thawing analysis. Only green buffer, a dromedary camel's semen extender, is commercially available. However, its scarcity may result from camelids' restricted use of artificial intelligence (AI) and their smaller population size than other species. Most AI centers prefer commercial extenders due to their effectiveness, quality, hygienic manufacture, safety, and simplicity of preparation. Because commercial camel-specific diluents aren't readily available, other species' diluents are used instead to preserve camel sperm, such as Triladyl, AndroMed, and OPTIXcell for cooled camel sperm and INRA-96 for freezing sperm.

The Tris buffer and the yolk of eggs are the two most frequently utilized materials added to extensions when used to freeze camelid and other species' semen [4]. Although Egg yolks have been used as extenders in several cases and shown to be troublesome for semen cryoprotection, this has prompted researchers to look for viable animal-free alternatives. Low-density lipoprotein (LDL), soy lecithin, and liposomes are the most often utilized alternatives. Using egg substitutes without using animals for semen cryopreservation has produced encouraging results. The two bull extenders with an egg yolk replacer that are most frequently used are AndroMed and OPTIXcell.

While OPTIXcell uses liposomes, AndroMed uses soy lecithin. Although they were first designed for use with cattle, they have successfully enabled the cryoprotection of Semen in rams, cats, and Iberian red deer, among other species [5]. To maintain camel semen in a cold state, OPTIXcell, and AndroMed have both been attempted. The effectiveness of Egg yolks has been utilized as extenders in several has yet to, as far as we know, be the subject of any prior reports. In order to examine the effectiveness of cryopreservation for dromedary camel semen, this study also contrasted in-lab formulations SHOTOR to commercial extenders that either did not contain egg yolks or did contain egg yolks.

The objective of study [6] was to assess how different commercial extensions and storage temperatures impacted the viability of dromedary camel sperm during liquid preservation. Throughout the time that the sperm remained in the liquid, their kinematics, viability, and acrosome integrity were evaluated. The study's findings demonstrated that the choice of extender and storage temperature substantially impacted the dromedary camel sperm's quality during liquid preservation. The objective of study [7] was to investigate the effects of selenium and zinc nanoparticles (ZnONPs and SeNPs, respectively) and vitamin C and vitamin E supplements on the cryopreservation of dromedary and camel epididymal spermatozoa. They compared the effects of various accessories on the cryopreservation of camel epididymal spermatozoa. Vitamin C, vitamin E, selenium, zinc, zinc nanoparticles (ZnONPs), and selenium nanoparticles (SeNPs) were all included in the supplements. It was

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discovered that adding ZnONPs and SeNPs to the SHOTOR extender increased the capacity of camel epididymal spermatozoa to tolerate freezing and thawing, or cry tolerance.

The difficulties and restrictions related to artificial insemination (AI) in dromedary camels, as well as the existing practices and outcomes of the technique, appear to be the goal of the study [8]. The method described involves mounting male camels crouching on a sitting estrus female utilizing an artificial bull vagina (AV) to collect their Semen. The volume of the Semen ranges from 2 to 13 mL, and the concentration of sperm varies greatly, with a pH between 7.0 and 8.0. The prevalence of camel crossbreeding, particularly between Bactrian and dromedary hybrids, which have historically been produced by natural mating in various areas of Central Asia and the Middle East, is briefly mentioned in the text.The goal of the study [9] was to assess how varied freezing rates and thawing temperatures affected the post-thaw quality of camel spermatozoa. By positioning the straws at various heights above the liquid nitrogen surface for multiple durations, ten engages from five male camels were frozen at five different freezing speeds. It shows that camel semen quality would likely be preserved while freezing fast, especially at 1 centimeter above liquid nitrogen. For optimal post-thaw quality, it is also advised to thaw at 60°C.

The goal of article [10] was to assess how two antioxidants, catalase and epigallocatechin, affected the viability of cryopreserved dromedary camel spermatozoa. Six male dromedary camels were used to gather semen samples. Single-layer centrifugation was used to select the spermatozoa, which were subsequently cryopreserved. Study [11] aimed to look into the features of dromedary camel sperm after it had been chilled and preserved for 24 hours. The presence of catalase (500 IU/mL) and two different buffers and cryoprotectants were also investigated. Three experiments made up the study's execution. After being liquefied in Tris-Citric acid-Fructose buffer, five ejaculates were centrifuged through a colloid. The sperm were cooled for 24 hours in Green Buffer or INRA-96® containing 0%, 3%, or ethylene glycol or glycerol. It was maintaining sperm motility after freezing required the injection of catalase during cooling.

Study [12] examined the quality of dromedary camels' post-thaw sperm and the presence and distribution of aquaglyceroporin 3 (AQP-3) in sperm cells. The researchers did not discover any correlation between AQP-3 expression and the sperm's reaction to the freeze-thawing procedure despite the heterogeneity in AQP-3 expression among individual male ejaculates. The study results show that sperm responsiveness to the freeze-thawing process in dromedary camels is not reliably predicted by AQP-3 expression or sperm head morphometry. Article [13] aimed to assess the effects of various cryoprotectants, freezing extenders, and Orvus Es Paste concentrations, as well as different frozen rates, on the cryopreservation of dromedary camel sperm. Five male camels' sperm samples were gathered, each contributing two ejaculates. The Semen was then frozen using various combinations of Orvus Es Paste (present or absent), Orvus Es Paste (3% and 6% glycerol or ethylene glycol), freezing at two different heights, and cryoprotectants (Green Buffer® or INRA96®) are some examples of the cryoprotectants above liquid nitrogen (1 cm and 4 cm). the best dromedary camel sperm post-thaw parameters were obtained when Green Buffer extender, 3%–6% ethylene glycol, or 6% glycerol were used as cryoprotectants without the addition of Orvus Es Paste.

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The study's objective [14] was to determine if seminal plasma Cryopreserved dromedary epididymal surface glycosylation patterns are altered by (SP) exposure spermatozoa (ES), with the hope of improving dromedary camel-assisted reproduction methods. The sperm samples were collected and diluted Cryopreserved either with or without the inclusion of 15% SP, with an egg yolk extender that has received tris citrate clearance. The glycan composition of the sugar coating on the surface of sperm called the glycocalyx, in dromedary camel epididymal sperm (ES) was discovered to be affected by exposure to seminal plasma (SP) in the study. Study [15] sought to ascertain whether recipient camels could produce spermatozoa of donor origin as well as the viability of testis germ cell transplantation (TGCT) in dromedary camels. Microsatellite markers were used to identify donor DNA in the semen samples taken from the recipient camels 13–20 weeks following the transplant of donor cells. The study's findings showed that camels might successfully receive heterologous testicular germ cell transplants, and the recipients were able to create spermatozoa from the donor camel.

The study assessed the effectiveness of various commercially available extenders to cryopreserve dromedary camels' Semen. The study's specific objective was to compare the performance of egg yolk-supplemented extensions (Triladyl, Steridyl) to egg yolk-free extensions (AndroMed, OPTIXcell) utilizing the camel-specific extension SHOTOR as a reference.

Materials and Methods

Commercial Tris-based extenders with and without egg yolks (T-BE) are used in reproductive technology to preserve and prolong the vitality of sperm cells.

Experimental Design and Animals

The current study used 7 adult, fertile, dromedary camel bulls with a mean body condition score of 3. Their ages ranged from 6-7. Camel bulls were used as test subjects at a research facility run by the King Saud University Institute of Wildlife Production in Riyadh, Saudi Arabia, housed separately. The animals were given free access to fresh water and fed a diet including alfalfa hay, straw, and industrial pellets.

Preparation of Chemicals and Extenders

The lab-formulated semen extension SHOTOR is prepared using a variety of substances, including Tris, acid citric, fructose, glucose, gentamicin, and glycerol. The commercially available sperm included Triladyl, Steridyl, AndroMed, and OPTIXcell extenders. Antibiotics, phosphate lipid Tris, acid citric, glucose, antioxidants, buffers, glycerol, and Tris, are all components of the AndroMed formulation. The ingredients in OPTIXcell include buffers, mineral salts, phospholipids, water, glycerol, buffering agents, antioxidants, and antibiotics. With 335 mOsm/kg chemical and pH 7.9, the laboratory- Semen extender SHOTOR, which was created, had 54.9 mM fructose, 66.4 mM acid citric, 66.6 mM sugar, and 225.6 mM tris. 5% glycerol, 25% newly produced egg yolk, and 0.2 mg/mL gentamicin were given to SHOTOR. Bidistilled water was used to dilute steroidal by a factor of 1:1.5.

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OPTIXcell was created using a 1:2 bidistilled water was diluted, and AndroMed was made using a 1:4 dilution.

Cryopreservation and Semen Processing

Ejaculates were obtained during breeding season twice a week in the early morning hours utilizing an artificial vaginal setup. Five samples were created by dividing ejaculates that had a normal volume and color and were contamination-free. According to its viscosity, every specimen was split among five diluents, diluted gradually in a hot water bath utilizing one of the diluents being studied, then manually liquidated for 45–90 minutes using gentle pipetting motions. The sperm samples were placed into 0.25-mL straws at 5 C following a 2-hour adjustment period. Identical pieces were assessed just before freezing (pre-freezing examination). The straws were submerged in liquid nitrogen after being frozen for 10 minutes at 8 cm above the surface. The post-thawing assessment was finished after the frozen Semen was kept for at least 48 hours. Five times the experiment was conducted.

Semen Analysis

After thawing, a minimum of three straws per extender and per repetition were independently assessed. Semen DNA fragmentation, plasma membrane integrity, morphology, motility, and vitality were evaluated after the straws had been frozen and thawed at 37 °C for the 30s.

Motility of Sperm

To achieve sperm concentrations of around 25 106 sperm/mL, sperm samples were once again diluted with Tris buffer at a ratio of 1:4 or 1:5. Leja slides, a phase contrast microscope, a 20 objective, and CASA were used to assess sperm motility. 200 spermatozoa and The analysis included no less than seven microscopically field videos selected randomly. The picture's resolution was 768 * 576 pixels. Depending on various sperm motility, subpopulations on the SCA setups were identified. These were the SCA settings: Particle size ranges from 4-75µm2; the cut-off values for the VCL are 15µ m/s for slow, 50µm/s for medium, and 80 µm/s for rapid; progressivity is greater than 80% of STR; circularity is less than 55% LIN; connectivity is 12 pixels; and VAP points are 5 pixels.

Vitality of Sperm

Hoechst trihydrochloride trihydrate stain and 11 µmL of Semen were combined, and the mixture was warmed to 37 °C. The mixture was incubated for another five minutes after adding 2µL of warm propidium iodide. Viable sperm cells were identified using the Hoechst trihydrochloride trihydrate stain, which fluoresced blue. On the other hand, dead sperm cells were stained with propidium iodide, which revealed red under fluorescence. The material was put Using ordinary slides with a backing glass following staining and incubating. By doing this, the sample is properly positioned for visualization and analysis. An SCA system-attached fluorescent emission unit assessed 200 or more spermatozoa. The goal was to determine the percentage of the total number of sperm tested were viable sperm, as shown by the blue staining.

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Plasma-Membrane Integrity of Sperm

The study used the hyperosmotic swelling (HOS) method to evaluate the spermatozoa plasma membranes for integrity. To carry out this procedure, 200 liters of an osmotic-pressured solution of fructose sodium citrate known as HOS solution of roughly 60 mOsm/kg—was combined with 50 liters of Semen. The combination was then incubated for a further hour at 35 °C for 45 minutes. The sample was transferred on a glass slide, and a cover slip was placed on top following the incubation period. After that, the prepared slide was looked at with a 400x light microscope. The researchers studied the shape of the sperm tails under a microscope. The described procedure examined at least 200 spermatozoa to get statistically significant findings. The number of spermatozoa with coiled tails was next counted, and the result was divided by the total number of spermatozoa examined to determine the percentage of spermatozoa with intact plasma membranes.

DNA fragmentation in sperm

The passage describes the methodology for assessing sperm DNA fragmentation using the Halomax DNA kit, a commercially available kit provided by Halotech, a company based in Madrid, Spain. The procedure follows the instructions provided by the manufacturer. To begin, a gel made of agarose is prepared and incubated at high temperature (5 minutes of incubation at 90-100°C was followed by 5 minutes at 37°C. Then, 50 mL of agarose gel and 25 L of Semen are combined. A portion (25 µL) of this mixture is transferred onto a specially coated slide with a 22 mm x 22 mm coverslip on top. After 5 minutes of cooling the slide at 4 °C, the coverslip is then carefully removed. The slide is then submerged in an acidic solution for 7 minutes. This step is followed by immersion for 25 minutes in a lysing solution. After being rinsed with distilled water, the slide gets dehydrated by exposing it to increasing ethanol concentrations for 2 minutes each. The slide is then cleaned with tap water, stained with Wright dye for 60 minutes, and left to dry at room temperature (25°C).

Evaluation of Sperm Morphology and Morphometrics

After draining off the excess stain, the slides were submerged in distilled water for about three seconds. As the dyed smears dried, they were viewed under a 600x light microscope. At least 200 species' morphology spermatozoa were assessed, and the total amount of aberrant sperm was manually quantified and expressed as a percentage. Calculations of Sperm Four parameters: Following a 2-hour adjustment, samples were placed into 0.25 mL straws and kept at 5 C. Comparable examples were examined and measured after the data had been transferred into an Excel spreadsheet.

Analytical Statistics

To investigate the relationship between cryopreservation and extender type, the variables in the statistical evaluation system were modeled using a general linear model using an analysis of variances (ANOVA). The Duncan multiple range test identified significant discrepancies between means. The standard error (SE) was used to describe the data ± as the mean. The cut-off there was p 0.05 statistical significance.

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Result

For this study, 104 engages from 8 bulls were collected. 18 participants were among the samples that met the initial microscopic evaluation's final requirements. The various diluents in which these samples were split evenly. In all experimental diluents, freezing dramatically reduced sperm vitality, total motility, progressive motility, the integrity of the plasma membrane, DNA integrity, and abnormalities.

Effect of various extenders on sperm motility dynamics and pre-freezing, post-freezing, and thawing conditions

The impact of various extenders on sperm motility during pre-freezing, post-freezing, and thawing is discussed in Tables 1 and 2. Compared to other diluents, the proportion of rapidly progressing sperm cells (class A) was considerably greater in samples diluted with SHOTOR. The specimens cut with SHOTOR had a significantly larger percentage of slow-progressive sperm cells (class B) than Steridyl or AndroMed were used to dilute samples. At the same time, all other diluents produced intermediate results. Comparing AndroMed to all other extenders, the percentage of not progressive sperm cells (class C) was much higher. Still, SHOTOR made the least of not developed eggs than any other dilution.

Tables (1): Effect of various extenders on sperm motility dynamics and pre-freezing , thawing condition

Time	Parameter	Seman Extenders									
		SHOTOR		Triladyl		Steridyl		OPTIXcell		AndroMed	
		M	SE	M	SE	M	SE	M	SE	M	SE
Prefreezing	Total motility, %	79.41	1.39	81.19	0.67	78.31	1.36	79.93	0.65	80.15	0.96
	Total Progressive, %	21.56	1.84	18.74	0.95	15.79	1.82	17.45	1.12	13.29	1.09
	VCL, µm/s	48.68	0.34	49.08	0.24	48.86	0.28	49.66	0.24	46.37	0.29
	VSL, µm/s	12.86	0.40	13.29	0.42	12.83	0.39	13.26	0.38	12.58	0.39
	VAP, µm/s	23.45	0.18	24.06	0.14	23.98	0.17	24.12	0.14	22.94	0.16
	LIN ,%	24.99	0.22	25.99	0.12	25.13	0.22	25.83	0.12	25.59	0.22
	STR, %	50.65	0.30	50.89	0.22	49.97	0.32	50.83	0.22	49.17	0.020
	ALH, µm	3.45	0.04	3.36	0.03	3.42	0.04	3.46	0.015	3.21	0.015
	BCF, Hz/s	3.78	0.05	3.97	0.04	3.91	0.04	3.99	0.04	3.8	0.02

Table (2): Effect of various extenders on sperm motility dynamics and post-freezing, and thawing conditions

Time	Parameter	Seman Extenders									
		SHOTOR		Triladyl		Steridyl		OPTIXcell		AndroMed	
		M	SE	M	SE	M	SE	M	SE	M	SE
Post thawing	Total motility, %	35.09	1.342	38.53	0.83	34.6	0.86	28.41	0.88	31.98	1.49
	Total Progressive,	5.15	0.57	10.06	0.68	5.59	0.28	3.87	0.31	3.79	0.34

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	%										
	VCL, µm/s	28.99	0.065	35.27	0.56	32.58	0.69	28.05	0.55	25.68	0.76
	VSL, µm/s	8.97	0.29	13.07	0.28	10.49	0.29	8.53	0.24	8.04	0.39
	VAP, µm/s	14.64	0.36	17.89	0.29	16.54	0.35	14.05	0.27	12.84	0.39
	LIN ,%	32.34	10	35.43	0.62	29.91	10	30.86	10	32.28	0.72
	STR, %	57.48	10	65.54	0.92	56.21	10	56.93	0.82	58.98	0.92
	ALH, µm	2.35	0.06	2.73	0.05	2.42	0.06	2.25	0.05	2.12	0.07
	BCF, Hz/s	2.86	0.08	3.89	0.08	3.76	0.09	2.94	0.09	2.93	0.08

Effect of Various Extenders on Sperm Abnormalities, Plasma Membranes Integrity, which is DNA Integrity, and Semen Vitality Before and After Freezing and Thawing

The impact of various extenders on the health of the sperm, the integrity of the cell membrane, the DNA, and any abnormalities in sperm before and after freezing and thawing are described in Tables 3 and 4. SHOTOR produced greater sperm vitality, DNA integrity, and the honesty of plasma membranes in post-thawing semen samples than any other diluent. Steridyl made much lower values than Triladyl, whereas OPTIXcell and AndroMed's sperm parameters were the worst. The greatest number of abnormalities in sperm was recorded using OPTIXcell, and SHOTOR or Triladyl, the lowest.

Table (3): Effect of Various Extenders on Sperm Abnormalities, Plasma Membranes Integrity, which is DNA Integrity, and Semen Vitality Before and After Freezing and Thawing

Time	Parameter (%)	Seman Extenders									
		SHOTOR		Triladyl		Steridyl		OPTIXcell		AndroMed	
		M	SE	M	SE	M	SE	M	SE	M	SE
Pre freezing	Sperm vitality	87.24	0.53	87.43	0.58	79.13	0.35	82.44	0.70	83.67	0.74
	Plasma membrance interity	85.49	0.59	87.79	0.32	80.02	1.03	82.02	0.82	82.32	0.63
	DNA integrity	97.35	0.35	96.00	0.59	85.35	0.35	88.89	0.59	91.02	0.59
	Sperm abnormalities	6.27	0.09	6.52	0.18	8.00	0.12	12.02	0.08	87.77	0.13

Table (4): Effect of Various Extenders on Sperm Abnormalities, Plasma Membranes Integrity, which is DNA Integrity, and Semen Vitality Before and After Freezing and Thawing

Time	Parameter (%)	Seman Extenders									
		SHOTOR		Triladyl		Steridyl		OPTIXcell		AndroMed	
		M	SE	M	SE	M	SE	M	SE	M	SE
Post	Sperm vitality	57.23	1.5	51.13	1.26	46.30	0.62	38.78	0.85	39.22	1.29

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thawing	Plasma membrance interity	59.88	1.19	52.98	1.02	45.36	0.67	37.62	0.75	38.92	1.07
	DNA integrity	91.02	0.59	88.02	0.59	83.00	0.59	73.00	0.59	78.02	0.59
	Sperm abnormalities	11.77	0.083	12.52	0.12	15.77	0.13	21.02	0.079	16.02	0.09

Effect of Various Extenders on Sperm Morphometry Before and After Freezing and Thawing

The impact of various extenders on sperm head morphometry before freezing and following thawing are detailed in figure 1 (a,b) and 2 (a,b). A few sperm head morphometric characteristics in the post-thawing examination revealed a substantial difference between samples with various diluents. In comparison to OPTIXcell and Triladyl, camel sperm that had been frozen in AndroMed, had a much smaller head perimeter. In contrast to all other diluents but Steridyl, AndroMed produced significantly reduced ellipticity and elongation. Steridyl produced significantly lower sperm regularity percentages than SHOTOR & Triladyl. At pre-freezing and post-thawing examination, the kind of diluent had no discernible impact on the proportion of the head area that the acrosome occupied.

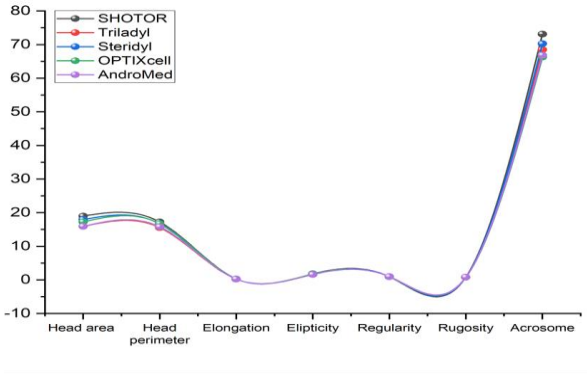

Figure 1(a): Mean value for prefreesing

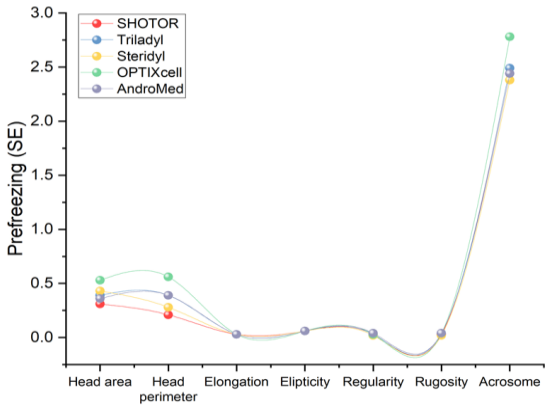

Figure 1(b): SE Value of prefreezing

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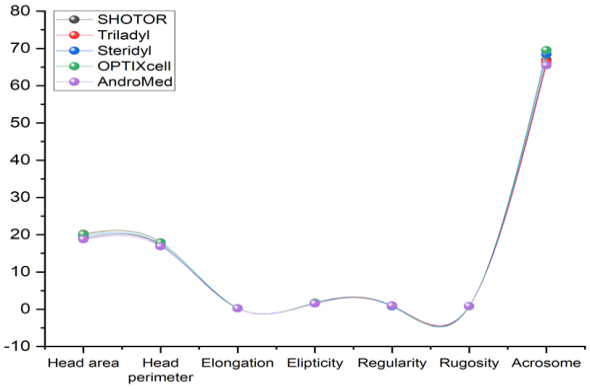

Figure 2(a): Mean value of pre thawing

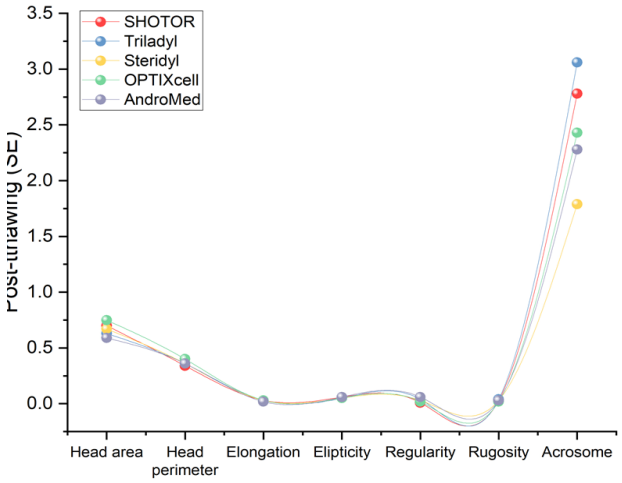

Figure 2(b): SE value of post thawing

Discussion

The effectiveness of several commercialized egg yolk-supplemented and yolk-free eggs The study compared tris-based extensions for freezing dromedary camels' sperm. The precise extenders evaluated were AndroMed, OPTIXcell, Triladyl, Steridyl, and SHOTOR. The control was a camel-specific extension. The researchers collected semen samples from seven adult dromedary camels and evaluated and diluted the samples with the different extenders mentioned above. After being diluted, the Semen was gradually cooled and brought into equilibrium, and then it was frozen in a solution of liquid nitrogen. Samples of the Semen were assessed before and after freezing and thawing cycles to analyze various parameters, including DNA fragmentation, kinetics, vitality, abnormalities, and plasma membrane integrity. Sperm analysis with computer assistance was employed for the evaluations. Samples of Semen were diluted with SHOTOR for the pre-freezing assessment and exhibited higher progressive sperm motility compared to Steridyl, OPTIXcell, or AndroMed-diluted models are used. More sperm viability and DNA integrity were achieved with Triladyl and

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SHOTOR than with any other diluent. Comparing Triladyl to SHOTOR, it was also evident that the plasma membrane integrity was greatly improved. Triladyl produced noticeably greater sperm motility in the examination following freezing compared to SHOTOR, Steridyl, and AndroMed. OPTIXcell was the least efficient in terms of sperm motility.

Conclusion

The study found that all extenders tested Semen from dromedary camels can be cryopreserved using AndroMed, OPTIXcell, SHOTOR, Triladyl, and Steridyl. But the highest-quality sperm after thawing came from SHOTOR and Triladyl. These results concluded that the finest extender for cryopreserving dromedary camel semen is trial. It's crucial to note that this is a summarized discussion of the study's findings, and further details or context may be available in the original research publication. The study may have limitations due to its limited sample size or focus on a particular community of dromedary camels. Future studies could examine the effectiveness of these extenders on a bigger scale, evaluate their performance against that of other extenders, look into the long-term implications of cryopreservation, or improve the cryopreservation methodology.

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