



DRAGON FRUIT EXTRACT (HYLOCEREUS UNDATUS) IN YOLK TRIS DILUTION TO MAINTAIN KACANG GOAT SPERMATOZOA QUALITY AT 5°C

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ABSTRACT

The purpose of this study was to determine the effectiveness and best concentration of dragon fruit peel extract as a semen diluent in maintaining the quality of kacang goat spermatozoa stored at 5°C. The material used in this study was 2-3 years old kacang goat sperm collected using an artificial vagina. Laboratory experimental method with a complete randomized design (CRD) consisting of 4 treatments and 5 replicates. Sperm was diluted with dragon fruit peel concentration treatment P0 (0%), P1 (2%), P2 (4%) and P3 (6%). The variables observed in this study were progressive motility, viability, and abnormality. The results of the study after 5 days of storage at 5 ° C showed the best average progressive motility of spermatozoa was in P2 (57.00 ± 4.47%), viability of spermatozoa P2 (81.80 ± 2.39%) and abnormalities of spermatozoa P2 (5.00 ± 1.22%). The 4% dragon fruit peel extract was higher than the control (0%), 2% and 6%. The addition of dragon fruit peel extract had a significantly better effect on progressive motility, viability, and spermatozoa abnormality. Adding dragon fruit peel extract with a concentration of 4% is the best source of antioxidants in egg yolk Tris diluent. It can maintain the quality of kacang goat spermatozoa at 5°C storage for 5 days.

Keywords : Dragon fruit peel extract, kacang goat sperm, egg yolk tris

INTRODUCTION

Public awareness to consume animal protein is increasing from time to time, these needs need to be sought in livestock development in increasing meat production. Livestock that can produce meat to meet animal protein needs are goats. Bean goats are one type of livestock that has good prospects for development in supplying national meat needs. Therefore, to increase the productivity of kacang goat that are familiar to Indonesian farmers.

The kacang goat is one of Indonesia's local goats that has advantages over other species such as Boer, Ottawa and Peranakan Etawa (PE) goats. Kacang goats are highly adaptive to weather, tolerant of existing feed conditions, and very productive. This can be proven by the percentage of twin births around 52% and can give birth to triplets around 2.6% but it is very rare (Yondaime, 2019). Therefore, the advantages of kacang goat must be maintained to increase their productivity.

One way to maintain the population and increase the productivity of kacang goat is through artificial insemination (IB). Artificial insemination is one of the technologies that are relatively easy, cheap, and effective in increasing livestock productivity (Zaenuri, 2018). Factors affecting the success of IB are influenced by semen diluent, semen storage, and proper insemination time (Zaenuri, 2018 and Lukman Hy, at al. 2014).

Semen preservation at low temperatures of 3-5°C will cause damage to spermatozoa due to cold shock, which damages the cell plasma membrane and results in the death and quality of spermatozoa (Souhoka et al., 2009). A good diluent should have the same physical and chemical properties as semen plasma, not have toxic or poisonous properties, and have the ability to maintain and protect semen quality during preservation.

Egg yolk tris diluent is very often used in maintaining the quality of spermatozoa but has deficiencies such as vitamin C and antioxidants so it is necessary to add ingredients that protect the quality of spermatozoa such as antioxidant compounds (Hariadi, 2018). Feradis (2010) explains that the addition of antioxidants to diluents can be beneficial in improving semen quality. Providing antioxidants with the right composition can provide maximum results to prevent and reduce lipid peroxide reactions. Due to free radical activity, the plasma membrane of spermatozoa, which is rich in unsaturated fatty acids, is susceptible to lipid peroxide reactions (Bebas et al., 2016). Antioxidants can be found in various types of vegetables and fruits, one of which is dragon fruit (*Hylocereus poliovirus*). LukmanHY, at al. 2022a) have done research using pomegranate juice (*Punica Granatum L.*) 10% in the diluent is able to provide spermatozoa motility $57 \pm 5.70\%$, to conduct further research want to try using juice tone fruit.

Dragon fruit is a fruit of the cactus species of the *Hylocereus* and *Selenicereus* genera, originating from Mexico and has a high content of antioxidant actives, namely flavonoids. Fitri et al. (2016) explained flavonoids are one of the antioxidant compounds that function to overcome or neutralize free radicals. Dragon fruit skin is a part that is generally not utilized by the community, but in dragon fruit skin there is abundant antioxidant content. Dragon fruit peel extract contains many anthocyanin antioxidants (Noor et al., 2016). Wulandari (2016) explained that anthocyanin pigments classified as flavonoids can function as antioxidants or ward off free radicals. Theoretically, dragon fruit peel extract can prevent and maintain the quality of spermatozoa due to the influence of free radicals and cold shock during sperm preservation at 5°C.

Based on this description, it is necessary to research the effect of adding dragon fruit peel extract (*Hylocereus undatus*) to egg yolk Tris diluent to maintain the quality of Kacang goat spermatozoa at 5°C. This study is expected to provide information to the public, farmers, and inseminators about the benefits of dragon fruit peel extract as an additional ingredient of semen diluent to maintain sperm quality at 5°C.

RESEARCH MATERIALS AND METHODS

The research material is 2-3 years old kacang goat sperm obtained from breeders in Karang Pule Sekarbela village, Mataram city. Sperm collection using an artificial vagina is done 3 times a week. Examination, assessment, and processing of sperm will be carried out at the Laboratory of the Center for Bioscience and Biotechnology, Faculty of Mathematics and Natural Sciences, Mataram University.

The materials used in this study were dragon fruit peel (*Hylocereus undatus*), tris (hydroxymethyl) aminomethan ($C_4H_{12}ClNO_3$), chicken egg yolk, aquabides (H_2O), fructose ($C_6H_{12}O_6$), citric acid ($C_6H_8O_7$), streptomycin ($C_{15}H_{21}N_7O_{12}$), O, negrosineosin, vaseline, sodium citrate, formaldehyde, warm water.

The tools used for semen collection are artificial vagina, collection tube, erlenmeyer, test tube, test tube rack, beaker glass, measuring cup, thermometer, analytical balance, aluminum foil, magnetic stirrer, hot plate, binocular microscope, TV/monitor, counter check, pH meter, micropipette, refrigerator, blue tip, object glass, cover glass, oven, water bath, filter paper, tissue, scissors, stationery and camera.

Research Methods

This study uses a laboratory experimental method using a complete randomized design (CRD) consisting of four treatments, namely: P0: 100% yellow tris (Control), P1: 98% yellow tris + 2% dragon fruit peel extract, P2: 96% yellow tris + 4% dragon fruit peel extract and P3: 94% yellow tris + 6% dragon fruit peel extract

Fresh sperm from the examination that has met the evaluation requirements are input into test tubes containing egg yolk tris diluent - dragon fruit peel extract according to the treatment. The sperm was dripped using a micropipette through the test tube wall and mixed slowly until homogeneous. The test tube was closed tightly and then put into a beaker glass containing water with a temperature of $20^{\circ}C$ which aims to reduce the temperature slowly until at $5^{\circ}C$.

The variables observed were motility, viability, and abnormality. The sperm diluent was egg yolk tris buffer containing dragon fruit peel extract. The sperm collection uses an artificial vagina. The smelly vagina containing sperm is immediately and slowly swung so that the sperm is collected in the collection glass. The sperm obtained is immediately taken to the laboratory for macroscopic and microscopic examination. Sperm declared good then carried out the process by the research treatment (LukmanHY, et al. 2022b). The treatment study was immediately assessed based on the research variables, namely motility, viability, and abnormality of spermatozoa at each time starting from 0 days to day 4 at a temperature of $5^{\circ}C$ in the laboratory where the study was conducted.

Analysis of data obtained was analyzed using variance (ANOVA). Furthermore, significantly different results ($P < 0.05$) were further tested with Duncan's test with the SPSS 16 program.

RESULTS AND DISCUSSION

The examination of fresh semen is done in two ways, namely macroscopic and microscopic examination. Macroscopic examination includes volume, color, consistency, pH, and aroma while microscopic examination includes concentration, mass motility, individual motility, viability, and abnormality. The quality and quantity of fresh semen obtained in kacang goat can be seen in Table 1.

Table 1. Average Fresh Semen Quality of Kacang Goat Result of the Study

Parameters	Results
Volume (ml)	0,92±0,10
Color	Milk White
Aroma	Typical Cement
Consistency	Somewhat Thick
Ph	7±01,00
Mass Motility	+++
Individual Motility (%)	77,00±2,45
Concentration (x 107 /ml)	215,8±24,33
Viability (%)	94,8±2,56
Abnormality (%)	5,80±1,33

Source: Primary data processed (2023).

The results of the study in Table 1 show that the volume of semen obtained is still quite high in accordance with LukmanHY, et al. (2022b), states that the volume of goat semen per ejaculate ranges from 0.5-1.5 ml. According to Hafez (2018), goat semen volume ranges from 0.5-1.2 ml/ejaculate. This difference in semen volume can be influenced by the type of livestock, body size, nation, age, frequency of collection, and various other factors such as temperature, feed, and maintenance methods LukmanHY, et al. (2022) a.

The color of the semen obtained from the results of this study is milky white. This indicates that the semen obtained from the collection is normal. Sekosi et al. (2016) stated that the color of normal fresh goat semen is white to cream. Abnormal semen will have a mixture of reddish color and brown color indicating that the semen is contaminated with blood, or greenish color which is a sign of decaying bacteria in the semen. This result is in accordance with Sumadiasa et al. (2023) which suggests that reddish cement is a sign that the cement is contaminated by fresh blood, while if the color is close to brown it is a sign that the cement has decomposed. The greenish color is a sign of the presence of putrefactive bacteria in the cement.

The smell of cement produced in this study is the typical smell of cement. The aroma indicates that the cement is normal and there is no contamination. This is in accordance with Sumadiasa et al. (2023) which suggests, that normal semen generally has a distinctive fishy smell accompanied by the smell of the animal itself. Abnormal semen has a foul odor aroma occurs when the semen contains pus caused by infection of the organs or reproductive tract of male animals.

The consistency or viscosity of cement obtained from the results of this study is rather thick. According to LukmanHY, et al. (2002) a, that good cement the degree of viscosity is almost the same or slightly thicker than milk, while the bad both color and viscosity is the same as coconut water.

The degree of acidity of fresh semen of kacang goat obtained from this study is higher than the results of research conducted by Sekosi et al. (2016), the degree of acidity of semen is generally in the range of 6.4 - 6.8 however, pH 7 in the studied semen is included in the neutral pH range. Following (Lukman HY, et al. 2022b), that the degree of acidity of cement is generally in the neutral pH range. If the pH of the semen is too acidic or alkaline it can interfere with the work of enzymes that help the respiration process in spermatozoa.

Spermatozoa mass motility provides an overview of the motion of spermatozoa in mass, namely the thicker and larger the waves and the faster the movement indicates the quality of spermatozoa is very good (LukmanHy, at al, 2022a). Spermatozoa mass motility has a tendency to move equally in one direction to form

thick and thin waves, moving fast or slow, depending on the concentration of live spermatozoa. Furthermore, it is also said that motility (+++) is the quality of spermatozoa with very thick and fast waves, (++) is a medium spermatozoa wave, and (+) indicates spermatozoa with slow waves. The mass motility obtained in this study was very thick and fast (+++).

Individual motility examination is very important to determine the quality of fresh semen. The percentage of spermatozoa motility of the results of this study is higher than the research of Kaka (2010), in which the average percentage of motility in fresh spermatozoa of kacang goat is 76.67%. Individual motility in this study is classified as good, as the opinion LukmanHy, et al. (2022) b, that good semen has individual motility ranging from 70-85%.

Factors affecting spermatozoa motility are semen collection method, collection environment and semen treatment after collection, interval between collections, semen evaluation, and male variation and seasonal variation (AX et al. 2008). These factors cause differences in sperm motility of each male kacang goat and other stud animals. The evaluation results of fresh semen of kacang goat obtained in this study have good quality. This is indicated by the percentage of individual motility of 77.00 ± 2.45 , so that this semen can be processed further for IB purposes. LukmanHy, et al. (2022b) stated that fresh semen must have a motility of $\geq 70\%$ to be further processed into frozen semen for IB purposes.

Assessment of the concentration of kacang goat spermatozoa is very important because it is used as a criterion for determining the quality of semen used to determine the level of dilution. The average concentration of spermatozoa obtained from the results of this study was $215.8 \pm 24.33 \times 10^7$ /ml. The concentration is lower than the results of research by Hartono (2008), the concentration of boer goat spermatozoa is 424×10^7 /ml. The difference in concentration is likely caused by the type of goat, breed, age, feed, temperature and frequency of ejaculation.

The percentage of viability is one of the parameters determining the quality of semen because the percentage of viability can be known how many percent of spermatozoa are alive. The percentage of viability is closely related to the fertility ability of spermatozoa. If the viability value of spermatozoa is high, the fertility ability will be high. The percentage of spermatozoa viability obtained from this study is higher than the results of Hartono's (2008) research on boer goats of 92%. The difference in viability is due to differences in goat breeds, feed quality, temperature, frequency of ejaculation and other factors (Souhoka, 2009).

The abnormality of spermatozoa obtained from the results of this study is lower than the research conducted by Delgadillo et al. (1992) with abnormalities of goat spermatozoa 6.4 - 10.3%. Measurement of spermatozoa abnormality is very important because high abnormality will reduce the success of fertilization, thus reducing the success of the Artificial Insemination program (LukmanHy, et al. 2022b).

Based on the results obtained from this study, it can be said that the kacang goat semen used in this study has good quality and is eligible for further processing both in liquid and frozen form.

Evaluation of Kacang Goat Semen After Dilution

Motility is one of the most important factors that determine spermatozoa fertility. If spermatozoa cannot move properly, it is not possible for spermatozoa to reach the egg and penetrate for fertilization. The average progressive motility of kacang goat spermatozoa is seen in Table 2.

Table 2. Mean progressive motility of Bean Goat spermatozoa at the level of dragon fruit peel extract in chicken egg yolk Tris diluent stored at 5°C.

Storage (Days)	Dragon Fruit Peel Extract Treatment (%)			
	0	2	4	6
1	66,00±2,24 ^a	72,00±2,74 ^b	75,00±0,00 ^c	68,00±2,74 ^a
2	62,00±2,74 ^a	68,00±2,74 ^b	72,00±2,74 ^c	67,00±2,74 ^b
3	58,00±4,47 ^a	60,00±3,54 ^a	68,00±2,74 ^b	61,00±2,24 ^a
4	50,00±3,54 ^a	59,00±2,24 ^b	63,00±2,74 ^c	53,00±2,74 ^a
5	42,00±2,74 ^a	47,00±5,70 ^a	57,00±4,47 ^b	47,00±2,74 ^a

Notes: Different letters on the same line indicate significant differences ($p < 0.05$).

The percentage of progressive spermatozoa motility during cold storage in egg yolk tris diluent was significantly higher in the addition of dragon fruit peel extract with concentrations of 2%, 4%, and 6% compared to the control treatment at 1 to 5 days storage.

Table 2 shows that the results of the study on the first day of the addition of 4% dragon fruit peel extract showed significantly different results ($p < 0.05$) with 0%, 6%, and 2% treatments. On the second day, the addition of 4% dragon fruit peel extract showed a significant difference ($p < 0.05$) with 0%, 6% and 2% treatments. On the third day of treatment, the addition of 4% dragon fruit peel extract showed a significant difference ($p < 0.05$) with the control 0%, 2% and 6%. On the fourth day of storage the addition of 4% dragon fruit peel extract showed different results ($p < 0.05$) with 0%, 6% and 2% control. On the fifth day of storage the addition of 4% dragon fruit peel extract showed significantly different results ($p < 0.05$) with 0%, 2% and 6% control.

Table 2 shows that in general, the addition of dragon fruit peel extract in chicken egg yolk Tris diluent is able to maintain the quality of kacang goat spermatozoa at 5°C storage. The addition of dragon fruit peel extract with a level of 4% at 5°C storage can provide a higher motility rate than other treatments and can be stored for 5 days with the average progressive motility of spermatozoa significantly different ($p < 0.05$) with 0%, 2% and 6% control.

On the fourth day of storage, progressive motility was high in the treatment of the addition of 4% dragon fruit peel extract. The high percentage of progressive motility in the addition of 4% dragon fruit peel extract level is due to the antioxidant content in the form of anthocyanin pigments that function to ward off free radicals. Wulandari (2016) explained that anthocyanin pigments classified as flavonoids can function as antioxidants or ward off free radicals. The addition of dragon fruit peel extract in a balanced amount in chicken egg yolk tris can provide energy and protect spermatozoa from the influence of free radicals and cold shock.

The results of this study are still higher when compared to Hariadi (2018) who added moringa seed extract in chicken egg yolk Tris diluent to get progressive motility results of $52.00 \pm 2.74\%$. This shows that the antioxidant content of dragon fruit peel is higher when compared to Moringa seeds. The use of dragon fruit peel extract is preferred as an addition to chicken egg yolk tris diluent to maintain the progressive motility of kacang goat spermatozoa. Furthermore, Amrillah, (2021) used the best 10% kiwi fruit juice, and Lukman HY at al. (2022) an on using pomegranate juice also uses 10% able to maintain the best motility.

The decrease in spermatozoa motility during the study occurred along with the length of storage, where the longer the storage the lower the percentage of progressive motility of spermatozoa. The longer storage time means that the energy required by spermatozoa is getting higher while the nutrients available in the semen are decreasing. Susilawati (2014) added temperature adjustment factors from livestock body temperature to room temperature can also affect the movement of spermatozoa due to physical conditions in the environment. Thus, there is an effect of different storage lengths using diluents on the motility of kacang goat spermatozoa at 5°C.

In the control treatment (without the addition of dragon fruit peel extract), the percentage of progressive spermatozoa motility was the lowest until day 5. This indicates that cold-stored spermatozoa in egg yolk Tris diluent without the addition of antioxidants are not able to maintain their motility. In this study, the best level of addition of dragon fruit peel extract in egg yolk Tris diluent that was able to maintain the progressive motility of kacang goat spermatozoa was 4%.

Table 2. shows the decrease in the percentage of progressive motility from day to day. The decrease in progressive motility in the 0% control treatment decreased the fastest than the other treatments. The rapid decrease in the percentage of motility in the control treatment was due to the absence of the addition of dragon fruit peel extract in the treatment. The decrease in progressive motility in the 4% treatment was the slowest than the 0%, 2%, and 6% control treatments. The slow decrease in the percentage of motility in the 4% treatment is due to the addition of dragon fruit peel extract which is suitable for maintaining the percentage of progressive motility in kacang goat spermatozoa from free radical attack.

Free radicals are molecules or atoms that are unstable and highly reactive because they have unpaired electrons in their outer orbitals, so they can react with body cell molecules by binding chain reactions that produce new free radicals. Some things that can cause the formation of free radicals are cell metabolism,

inflammatory processes and nutritional deficiencies (LukmanHy, at al 2014). Lack of nutrients in the 0% control treatment is one of the causes of the formation of free radicals so that they can attack spermatozoa cell molecules faster than other treatments that have been added with nutrients from dragon fruit peel extract.

Antioxidants as compounds that can inhibit oxidation reactions so as to protect cells against damage caused by free radicals (reactive oxygen species) (LukmanHy, at al, 2014). The mechanism of action of antioxidants has two functions, namely, antioxidants as providers of hydrogen atoms and slow down the rate of oxidation with various mechanisms of breaking the oxidant chain (Donald, 2000). Antioxidants are generally divided into two groups, namely flavonoid and non-flavonoid antioxidants. Flavonoid antioxidants are antioxidants under the class of polyphenols compounds found in plants such as anthocyanins, flavanols, and flavanones. Non-flavonoid antioxidants can be broken down into three categories, namely vitamins, minerals, and pigments in plants (Hasanah, 2015).

Dragon fruit peel extract contains high anthocyanin-type flavonoid antioxidants, so it can defend spermatozoa cell molecules from free radical attack. Anthocyanins which have the main function as a provider of hydrogen atoms will fill the lack of unstable molecules in free radicals so that the molecules become more stable and do not cause spermatozoa cell molecules to be exposed to free radicals.

Assessment of live and dead spermatozoa is done through the eosin-nigrosin staining procedure. Dead spermatozoa absorb the color due to increased cell wall permeability while live spermatozoa do not absorb the color. Viability of kacang goat spermatozoa in egg yolk tris diluent containing various concentrations of dragon fruit peel extract addition can be seen in Table 3.

Table 3. Mean viability of Bean Goat spermatozoa at the level of dragon fruit peel extract in chicken egg yolk Tris diluent stored at 5°C.

Storage (Days)	Dragon Fruit Peel Extract Treatment (%)			
	0	2	4	6
1	87,20±1,92 ^a	90,00±2,55 ^{ab}	91,00±2,55 ^b	89,20±2,28 ^{ab}
2	84,00±1,58 ^a	88,40±2,07 ^b	89,60±2,07 ^b	87,00±2,45 ^b
3	79,60±2,70 ^a	86,40±2,51 ^c	87,20±1,92 ^c	82,80±2,28 ^b
4	74,80±3,70 ^a	81,60±3,05 ^b	86,20±2,77 ^c	77,20±3,27 ^a
5	71,00±2,74 ^a	76,80±2,95 ^b	81,80±2,39 ^c	75,20±4,44 ^{ab}

Notes: Different letters on the same line indicate significant differences ($p < 0.05$).

Table 3 shows that storage with the addition of 4% dragon fruit peel extract on the first day was significantly different ($p < 0.05$) from the 0% control, but not significantly different ($p < 0.05$) from the 2% and 6% dragon fruit peel extract addition treatments. Storage on the second day with the addition of 4% dragon fruit peel extract showed significantly different results with 0% control, but not significantly different ($p < 0.05$) with the treatment of the addition of 2% and 6% dragon fruit peel extract. The third day of storage with the addition of 4% dragon fruit peel extract showed significantly different results ($p < 0.05$) with 0% and 6% control treatments, but not significantly different ($p < 0.05$) with 2% treatment. On the fourth day of storage, the treatment with the addition of 4% dragon fruit peel extract showed significantly different results ($p < 0.05$) with the control treatments of 0%, 2% and 6%. On the fifth day of storage, the treatment with the addition of 4% dragon fruit peel extract showed significantly different results ($p < 0.05$) with 0%, 2% and 6% control.

This study showed that the results obtained with the addition of dragon fruit peel extract to chicken egg yolk Tris diluent were able to maintain live spermatozoa compared to without the addition of dragon fruit peel extract. Storage for 5 days with the addition of 4% dragon fruit peel extract showed good results to maintain the quality of spermatozoa viability. The addition of 4% dragon fruit peel extract showed significantly better results ($p < 0.05$) with 0% control treatment.

The results of this study are higher than the research conducted by Agussalim (2012), with an average percentage of spermatozoa viability of 62.20% stored for 5 days. This is following the opinion of Kusumawati

et al. (2016) which states, that one of the minimum standards for the quality of semen that can be used for Artificial Insemination is to contain at least 50% live sperm (viability) and motile ones.

The high viability in the treatment of the addition of 4% dragon fruit peel extract is due to the addition of dragon fruit peel extract as a source of antioxidants in the form of anthocyanins and is also supported by egg yolk tris as a buffer in maintaining the viability of spermatozoa from the effects of cold shock. a cooling process that directly causes physical and chemical stress on the spermatozoa membrane (Susilawati, 2014). The low percentage of viability in the 0% control was due to the absence of antioxidant supply from dragon fruit peel extract in egg yolk Tris diluent in protecting spermatozoa from the influence of phospholipase A enzyme. The decrease in spermatozoa viability occurred over time, starting from the first day of storage to the fifth day. Long storage resulted in dead spermatozoa.

Table 3 shows the decrease in the percentage of viability from day to day for 5 days of storage. The decrease in viability in the 0% control treatment decreased faster than the other treatments. The rapid decrease in the percentage of viability in the control treatment was due to the absence of the addition of dragon fruit peel extract in the treatment. The decrease in viability in the 4% treatment experienced the slowest decrease than the 0% control, 2% and 6% P3 treatments. The slow decrease in the percentage of viability in the 4% treatment was due to the addition of dragon fruit peel extract by the right composition to help maintain the percentage of progressive motility in kacang goat spermatozoa.

The decrease in the percentage of spermatozoa viability is caused by the supply of spermatozoa nutrients that only come from seminal plasma alone without any additional nutrients from other mediums. The longer the storage time, the less nutrients in seminal plasma. This causes the percentage of viability of kacang goat spermatozoa at 5°C to decrease over time.

The results of this study indicate that the quality of kacang goat spermatozoa is still good for IB mating. The addition of 4% dragon fruit peel extract to chicken egg yolk tris diluent stored at 5°C can maintain the quality of spermatozoa up to 80% for 5 days of storage.

Abnormality is a morphological abnormality of spermatozoa that can affect fertility. The form of abnormality determines the picture of spermatozoa quality is broken tail, circular tail and broken head. The results of observations of abnormalities of kacang goat spermatozoa diluted with chicken egg yolk tris diluent and added with various concentrations of dragon fruit peel extract can be seen in Table 4.

Table 4. Mean abnormalities of Bean Goat spermatozoa at the level of dragon fruit peel extract in chicken egg yolk Tris diluent stored at 5°C.

Storage (Days)	Dragon Fruit Peel Extract Treatment (%)			
	0	2	4	6
1	4,60±1,34 ^b	3,40±1,14 ^{ab}	2,80±0,84 ^a	4,20±1,30 ^{ab}
2	6,20±0,45 ^{bc}	5,20±0,84 ^b	3,40±1,14 ^a	6,60±0,89 ^c
3	7,20±0,84 ^b	6,20±1,64 ^b	4,60±0,55 ^a	7,20±0,84 ^b
4	7,40±0,89 ^b	6,20±1,30 ^b	4,40±0,55 ^a	7,60±1,34 ^b
5	9,00±1,00 ^c	6,80±0,84 ^b	5,00±1,22 ^a	8,00±1,22 ^{bc}

Notes: Different letters on the same line indicate significant differences (p<0.05).

Table 4 shows the results of the study with the addition of 4% dragon fruit peel extract on the abnormality of kacang goat spermatozoa on the first day of storage showed results that were not significantly different (p<0.05) with 0% control and all treatments. The second day storage treatment with the addition of 4% dragon fruit peel extract showed significantly different results (p<0.05) with 0%, 2%, and 6% control. This occurred until the fifth day of storage, namely the treatment of the addition of 4% dragon fruit peel extract was significantly different (p<0.05) from the 0%, 2% and 6% controls.

The lowest abnormality in this study was at the 4% level which was stored for 5 days. The low abnormality in the treatment of 4% dragon fruit peel extract is due to the content of vitamins A, C and E as a source of antioxidants in maintaining the quality of spermatozoa from the influence of free radicals. The effect of vitamin E (a-tocopherol) can reduce abnormalities in goat spermatozoa (Werdhany, 1999).

The percentage of abnormality of kacang goat obtained from the results of this study is around 6-7%. This value is by the IB standard according to Sekosi (2016) which states that semen for IB purposes should not contain more than 20% abnormal sperm. So that the abnormal percentage of 6-7% of semen from this study is considered to have good quality.

Table 4 shows the increase in the percentage of abnormality from day to day for 5 days of storage. The increase in the percentage of abnormality in the 0% control treatment was higher than the other treatments. The high percentage increase in abnormality in the control treatment was due to no addition of dragon fruit peel extract. The increase in abnormality in the 4% treatment experienced the slowest increase than the 0%, 2%, and 6% control treatments. The slow increase in the percentage of viability in the 4% treatment was due to the addition of dragon fruit peel extract by the right composition to help reduce the level of abnormality of kacang goat spermatozoa.

The results showed that storage time had a significant effect ($p < 0.05$) on spermatozoa abnormality. The percentage of spermatozoa abnormalities increased in line with increasing storage time. According to Lukman Hy, et al. (2022) stated that the longer the storage time, the higher the percentage of abnormalities caused by cold stress and osmotic pressure imbalances due to ongoing metabolic processes.

Conclusion

1. The addition of dragon fruit peel extract in egg yolk Tris diluent is able to maintain the quality of kacang goat spermatozoa at 5°C storage for 5 days.
2. The addition of dragon fruit peel extract with a concentration of 4% is the best concentration in maintaining the quality of kacang goat spermatozoa for 5 days at 5°C storage.

Advice

1. The use of 4% dragon fruit peel extract in egg yolk Tris diluent should be used for the storage of goat semen in frozen form (frozen semen).
2. It is necessary to conduct field tests through artificial insemination (IB) to determine the fertility level of goat semen stored in liquid semen in chicken egg tris diluent with the addition of 4% dragon fruit peel extract.



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