Adding different amounts of Euterpe oleracea (Açai) fruit to the diet of laying hens changed the amount of sperm they produced and some of their histological features.

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ABSTRACT

This study was conducted in the poultry field at the College of Agriculture at Al-Qasim Green University for the period from December 1, 2022, to February 22, 2023, with the aim of investigating the impact of adding different levels of Açai fruit (Euterpe oleracea) to the diet of laying hens on the reproductive performance of roosters, specifically focusing on volume of ejaculate, sperm motility, and histological characteristics. At the age of 65 weeks, 25 roosters from brown Lohman laying hens were used in the experiment. The birds were randomly divided into five treatments, each consisting of five roosters with five replicates per treatment, with each replicate representing one rooster. The experimental treatments were as follows: control without addition, addition of 5 mg, 10 mg, 15 mg, and 20 mg of Açaí fruit for treatments T0, T1, T2, T3, and T4, respectively. The experiment continued for four periods, with each period lasting one week. During the study period, the experiment used 25 roosters from brown Lohman laying hens at the age of 65 weeks. Most treatments showed a significant increase ($P < 0.05$) in ejaculate volume compared to the control treatment. Researchers found a significant improvement in sperm motility. In terms of some histological characteristics, significant differences ($P < 0.05$) were evident in the relative weight of interstitial tissue components in Leydig cells and muscular cells. The fourth treatment showed significant superiority compared to the control treatment, while the first, second, and third treatments did not differ significantly from each other. On the other hand, we note that the addition of açai fruits to the diet led to a significant decrease in the relative weight of the interstitial spaces and intratubular distances in the third and fourth treatments compared to the control treatment. The relative weight of the seminiferous tubule lumen, basement membrane, and blood vessels showed no significant differences.

Keywords: Açaí fruits, Rooster laying hens, Reproductive traits, Histological traits

INTRODUCTION

Fecundity plays a crucial role in poultry production by determining the number of chicks that can be hatched from a given number of eggs. Fertility in roosters declines with age, starting to decrease at around 45 weeks of age [1]. This decline is associated with decreased testicular function, reduced sperm quality and quantity, and decreased testosterone levels in the blood [2]. The aromatase enzyme is thought to cause this decline by converting testosterone to estrogen [3]. Several studies have shown a significant decrease in hypothalamic secretions in aging roosters [4]. The aromatase enzyme converts testosterone to estrogen, inhibiting the secretion of gonadotropins, which in turn affects testosterone secretion in the testes [5]. The hypothalamic-pituitary-gonadal (HPG) axis and sperm production are both harmed when testosterone levels drop. This causes luteinizing hormone (LH) and follicle-stimulating hormone (FSH) levels to drop as well [6]. As a result, researchers have becom

increasingly interested in working to improve rooster fertility and the factors affecting sperm quality. This trend includes the use of plants that have an effect on fertility and improve reproductive and hormonal traits. People prefer herbal medicine over synthetic products due to the latter's side effects [7]. People have also used medicinal plants as antioxidants instead of chemicals [8]. One of these plants is acai (Euterpe oleracea). Acai is a plant that grows in the north of Brazil, in the Amazon basin. Acai berries have a variety of medicinal uses and effects, and their high nutritional value distinguishes them. They contain a variety of nutrients, including fatty acids, proteins, fiber, minerals, vitamins, and biologically active compounds such as anthocyanins, non-anthocyanin flavonoids, and phenolic acids [9]. The study aims to determine the effect of adding different levels of acai berries to the diet of white leghorn breeder hens and the effect of acai on reproductive and hormonal traits and the rate of fertility and hatching.

Materials and methods

Sperm concentration:

To measure the sperm concentration using a slide counting hemocytometer, which consists of 25 squares and each square consists of 16 small squares, the sperm concentration was measured by choosing 5 medium squares, namely the middle, upper left and right, and lower left and right, and they were examined in the shape of the letter Z, where 400 microliters were taken. Of sodium chloride 0.9 g, eosin 0.2 g, mercuric chloride 0.1 in 100 ml distilled water) and mixed with 10 microliters of semen and placed on the hemocytometer counting slide and the slide cover was placed over it, and then the following equation was applied[10]

$$(X/80) \times 400 \times 400 \times 10 = X \times 20000$$

Testicular Weight (grams):

At the end of the experiment, two males from each treatment were slaughtered after their weights were stabilized. The males were dissected, and the testicles were extracted from the body cavity. Their weights were recorded, and the following equation was applied to extract the relative weight of the testicle:

$$\text{Relative Testicular Weight} = \frac{\text{Testicular Weight}}{\text{Live Body Weight}}\ x\ 100$$

The data were analyzed statistically using a completely randomized design (CRD) to study the effect of the different treatments on the studied traits. The means were compared using [11] and the SAS statistical software, using the following mathematical model:

$Yij = \mu + Ti + eij$

Where: Yij = the observation value in the treatment., μ = the overall mean of the studied trait., Ti = the treatment effect., eij = the experimental error effect of the treatment.

RESULTS AND DISCUSSION

It is noted in Table (2) a significant increase in the second, third and fourth treatments ($P<0.01$) compared to the control treatment (T0) in sperm concentration. Also, the first treatment differed significantly from the control treatment and the rest. The transactions in the first and second periods are, respectively. The fourth treatment increased significantly at the level ($P<0.01$) compared to the control treatment in sperm concentration, while it did not differ from the third treatment, and no significant differences were recorded between the second and third treatments.

It is clear that there are significant differences in the average volumetric density of each of the sperm progenitors, as all treatments

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excelled compared to the control treatment, as well as the sperm cells and sperm precursors, as the first, second, and third treatments excelled significantly compared to the control treatment, while the fourth treatment did not differ significantly from the control treatment, and it was also observed that there was a significant superiority in the second treatments. The third and fourth treatments were in sperm, and the fourth treatment was significantly superior to all treatments in Sertoli cells . On the other hand, it is noted that adding açaí fruits to the diet resulted in a significant decrease in the relative weight of the intercellular Vacuoles and Interstitial spaces of the third and fourth treatments compared to the control treatment. No significant differences were recorded in the relative weight of the lumen of the seminal duct, the basal membrane, and the blood vessels.

The presence of vitamin C is also important [12] .confirmed that there was a significant improvement in individual and collective motility when treated with vitamin C. This improvement may be due to the content of açaí fruit in minerals such as calcium, magnesium, iron, and zinc, as well as its content of many fatty acids and amino acids [13].Alternatively, the improvement in these traits may be due to the high content of anthocyanins in açaí fruit [14]. Anthocyanins are a type of flavonoid that have a role in suppressing free radicals, stopping the oxidation of unsaturated fatty acids by hydrogen peroxide, and thus stopping the formation of aldehyde compounds such as (MDA), which are considered toxic compounds [15]. Adding medicinal plants led to improving the semen characteristics of broiler breede male Ross 308 [16]. Jaber also noted that adding medicinal plants improved the collective and individual movement of sperm of egg hatching cocks breed[17].

Table (1) Components of the feed used in feeding roosters and females

Ingredient	Females	Males
Maize	43.5%	28.2%
Wheat	29%	44.3%
Soybean Meal 44%	14.7%	8.5%
Wheat Bran	3.3%	14.8%
Sunflower Oil	0%	0.5%
Limestone	7%	1.2%
Premix *	2.5%	
Total	100%	
Calculated Chemical Composition		
Crude Protein	14.6 %	13.9 %
Metabolizable Energy (kcal/kg feed)	2764	2772
Methionine (%)	0.36	0.29
Lysine (%)	0.66	0.55
Methionine + Cystine (%)	0.49	0.44

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Calcium (%)	3.33	1.12
Available Phosphorus (%)	0.11	0.13

•Premix of Belgian origin, each 1 kg contains: Production stage for females: 0.36% methionine per kilogram, 0.85% lysine, 0.16% choline chloride, and 0.1% sodium bicarbonate. For males: 0.29% methionine, 0.61% lysine, 0.1% choline chloride, and 0.3% sodium bicarbonate.

Table (2) Effect of adding different levels of Euterpe oleracea powder to the diet on sperm concentration (10^9)

Treatment	Mean ± SE			
	1st week	2nd week	3rd week	4th week
T0	8.56± 0.19 c	7.39± 0.31 c	7.99± 0.27 d	8.17± 0.17 d
T1	9.57± 0.13 b	10.71±0.27 b	11.80±0.25 c	12.41±0.17 c
T2	11.25±0.44 a	12.71±0.33 a	13.37±0.32 b	13.29±0.26 b
T3	11.76±0.30 a	12.74±0.46 a	13.74±0.29 ab	14.42±0.22 a
T4	11.78±0.23 a	13.05±0.40 a	14.35±0.31 a	14.81±0.32 a
Sig.	**	**	**	**
The means with different letters within the same column differ significantly. N.S not significant *(P<0.05), **(P<0.01).(				

Table (3) The effect of adding different levels of acai fruit powder (Euterpe oleracea) to the diet on the relative weight of components of the testicular seminiferous tubule (%) (mean ± standard error) of laying hens.

Treatment	Sperm precursor	Sperm cells	Spermatids	Sperm	Sertoli cells
T0	0.56±4.82 B	0.70±4.81	0.60±5.26	0.84±7.33	0.73±4.99
T1	0.09±6.98 A	0.22±6.57	0.19±7.74	0.29±9.51	0.60±4.01
T2	0.82±6.45 Ab	0.80±5.94a	1.07±6.61	1.22±8.55	0.61±3.84
T3	0.69±6.37 Ab	0.51±5.43	1.05±7.38	1.05±9.25	0.62±4.54
T4	0.68±7.73 A	0.57±5.67ab	0.86±7.30	1.21±8.77	0.51±4.46
Sig.	*	N.S	N.S	N.S	N.S
The means with different letters within the same column differ significantly. N.S not significant *(P<0.05), **(P<0.01).(					

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