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A comparative study of the changes in some physiological characteristics in Awassi ewes dosed with aqueous extract of green tea with a mixture of vitamins A and E

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ABSTRACT

The current study focused on the study of the influence of giving aqueous extract of green tea with a mixture of vitamin A and E in the early pregnancy stage. The experiment used 20 local Awassi ewes, two years old and an average weight of 45.30 ± 2 kg. It was randomly distributed among four treatments, with five ewes for each group. The sheep of the first treatment were dosed with sterile and clean water free of additives and were regarded as the managed treatment. The second treatment was dosed with an aqueous extract of green tea at a concentration of (100 ml/ Kg BW). The third treatment was dosed with an aqueous extract of green tea water was managed in a concentration of (200 ml/ Kg BW), and the fourth treatment' ewes are dosed with a mixture of vitamin A at a dose (400 IU/ Kg BW) and vitamin E at a dose (200 IU/ Kg BW). The administration of aqueous green tea extract, particularly at 200 ml/kg, combined with vitamins A and E, significantly improved the physiological performance of Awassi ewes during early pregnancy. Notable improvements were observed in metabolic parameters such as blood glucose, total serum protein, immunoglobulin levels, liver enzymes (AST and ALT), and serum cholesterol. These results show that green tea and vitamin supplementation may positively influence biochemical traits and metabolic activities in ewes, leading to better overall health. Further research is required to explore the underlying mechanisms and long-term effects of these treatments on sheep health.

***Keywords*:** *Awassi, green tea, Vitamins, Biochemical, Extract*.

INTRODUCTION

After the success of development plans for animal production and its growth in any country, it is necessary to maintain the health and activity of animals on the farm, in order to achieve optimal production levels in the different stages of reproduction [1]. Pregnancy and lactation are pivotal stages that require great energy and careful monitoring to study the behavioral and physiological changes that occur in pregnant females [2]. Stress resulting from oxidation and metabolic disorders during pregnancy and lactation represent the most prevalent risks that threaten the survival of animals in complete welfare [3]. This ultimately leads to significant financial losses for breeders, as mentioned, therefore, the utilization of aqueous extract of green tea has been directed, which contains polyphenols and the main flavonoids, which consist of catechins, epicatechi (EC), galactocetin (GC), epicatechin gallate (ECG), and epigallocatechin gallate (EGCG), the most active and important component. It has loser proven that catechins can decrease blood glucose levels [4]. For that, it has been proven that components of green tea have hypoglycemic activities [5]. Green tea is favored as a drink due to its beautiful flavor and taste, and its consumption has been connected with anti-inflammatory antioxidant [6]. As for vitamins A, it was found that the provision of a sufficient amount of vitamin A, known as retinol, in the sheep's diet is necessary to achieve higher production growth rates and reduce expenses on treatments [7]. It is essential for animals and participates in many physiological events such as maintaining sight, genetic development, resistant regulation, metabolism, organ development and reproduction regulation [8]. It lacks leads to inhibition of differentiation of centrosome cells and their death, calcification and stagnation of centrosome cells. Its deficiency also leads to inhibition of the absorption of nutrients from the digestive tract, which is common in sheep and cattle in the absence of green pastures, and was as common during drought [9]. Vitamin E reduces oxidative stress caused by heat stress by reducing antioxidants that lead to increased production of gratis radicals and responsive oxygen type and weakening the antioxidant defense system. It also acts as an in cell antioxidation and safeguard cell membranes from oxidative harm [10]. The current study conducted to compare the physiological performance of pregnant Awassi ewes treated with different concentrations of green tea mining and mixtures of vitamins A and E.

Material and Methods

This experiment was performed in the sheep field to the department of animal production - college of Agriculture – University of Kirkuk, from 1/6/2024 to 1/9/2024 for a total period of 92 days. Twenty-two-year-old domestic ewes with an average weight of 45.30 ± 2 kg were used and haphazardly distributed over four transactions, with five ewes per transaction.

T1: Represented control group which the ewes dosed with sterile water with the same dose approved in the experiment.

T2: The ewes dosed with a watery extract of green tea at 100 mL/Kg BW.

T3: The ewes dosed with a watery extract of green tea at 200 mL/ Kg BW.

T4: The ewes dosed with a mixture of vitamin A at 400 international units/kg of body weight and vitamin E at 200 international units/ Kg BW.

Before the start of the experiment, the field was prepared, the animals were divided, and all animals received doses of antibiotics and immune boosters for four days, according to the recommendations of the veterinarian. The trial preparation process started from 1/6/2024 to 15/6/2024.

The duration of the study was divided into two physiological stages, as follows:

1- The stage of uniting estrus and fertilization: it started on 16/6/2024 until 30/6/2024, the vaginal sponges were applied on day 14 from start of oestrus, then 24 hours before ovulation and then 48 hours for fertilization.

2- Early pregnancy stage: started after fertilization 4/7/2024 to the end of the experiment 23/8/2024 and for 50 days. In semi-open barns, the animals shared housing and food. As advised by the National Research Council (NRC) for 2007 regarding feeding small ruminants, they were given the concentrated fodder, they required in the form of two food a day, in the morning and the evening, with dry coarse fodder (hay), in addition to the green fodder that was available in animal production fields. freely consuming water. The complete randomization design (CRD) The experiment's data were statistically analyzed using a one-way full randomization design. Duncan's polynomial test was used to assess the significance of any differences in the coefficients as well as Duncan's numerous range test [11]. The following mathematical model was utilized to analyze the data using the already prepared statistical analysis tool: $Y_{ij} = \mu + Si + eij$ [12].

Results and Discussion:

The results in Table (1) indicated that the third group exhibited the most notable increase ($P\leq0.05$) compared to all treatments, while the second treatment demonstrated a marked rise ($P\leq0.05$) relative to the control in total serum protein concentration during mid-early pregnancy. By the end of early pregnancy, the third treatment achieved the most pronounced elevation ($P\leq0.05$) compared to all others. The second treatment displayed a clear advantage ($P\leq0.05$) over the fourth and control groups, and the fourth group statistically exceeded ($P\leq0.05$) the control group at the same stage.

1. Table (1) Effect of dosing ewes with aqueous extract of green tea with a mixture of vitamins A and E on blood glucose concentration (mg/ 100 mL)

2. Treatment	3. Mid-early pregnancy		4. End of early pregnancy
5. T1(control)	6. 74.22±1.08 a	7.	8. 84.94±1.19 a
9. T2 (green tea 100 mL)	10. 61.69±0.97 b	11	12. 55.62±1.07 c
13. T3 (green tea 200 mL)	14. 58.50±1.49 c	15	16. 49.89±2.37 d
17. T4 (vitamin A and E)	18. 65.84±0.61 b	19	20. 73.31±1.07 b

21. Values were Mean ± standard error

22. The distinct letters inside the same column signify a marked difference among the research groups in the significance level ($P\leq0.05$)

The results at Table (2) appeared that the third bunch recorded the most noteworthy increase ($P<0.05$) compared to all treated groups, and the moment treatment recoded a noteworthy expand ($P\leq0.05$) compared to the control in add up to serum protein concentration in mid-early pregnancy. At the conclusion of early pregnancy, the third treatment recorded the most elevated noteworthy increment ($P\leq0.05$) compared to all medicines. The moment treatment appeared a noteworthy predominance ($P\leq0.05$) over the fourth and control medicines, and the fourth bunch noteworthy beated the control bunch ($P\leq0.05$) at the conclusion of early pregnancy.

Table (2) Effect of dosing ewes with aqueous extract of green tea with a mixture of vitamins A and E on total serum protein concentration (gm/ 100 mL)

Treatment	Mid-early pregnancy	End of early pregnancy
T1(control)	5.14±0.23 c	5.03±0.24 d
T2 (green tea 100 ml)	6.36±0.24 b	7.15±0.27 b
T3 (green tea 200 ml)	8.24±0.27 a	8.93±0.26 a
T4 (vitamin A and E)	6.28±0.37 bc	6.47±0.23 bc

Values were Mean ± standard error

The distinct letters inside the same column signify a marked difference among the research groups in the significance level (P≤0.05)

The statistical analysis presented in Table 3 revealed that immunoglobulin concentrations during mid and late gestation periods in the second and third treatment groups were significantly higher (P≤0.05) compared to both the first treatment group (control) and the fourth treatment group (vitamin A and E supplementation). Furthermore, the second and third treatment groups demonstrated a significant increase (P≤0.05) relative to the fourth treatment and control groups at the conclusion of the early gestational period.

Table (3) Effect of dosing ewes with aqueous extract of green tea with a mixture of vitamins A and E on serum immunoglobulin (mg/ 100 mL)

Treatment	Mid-early pregnancy	End of early pregnancy
T1(control)	31.89±0.71 b	30.47±0.72 b
T2 (green tea 100 ml)	36.88±0.39 a	36.08±0.26 a
T3 (green tea 200 ml)	36.29±0.54 a	36.27±0.54 a
T4 (vitamin A and E)	34.79±1.32 ab	32.12±2.18 b

Values were Mean ± standard error

The distinct letters inside the same column signify a marked difference among the research groups in the significance level (P≤0.05)

The results in Table (4) appear that amid mid-early pregnancy, the third treatment driven to the foremost noteworthy diminishment (P<0.05) in AST levels compared to the other test bunches, with no striking contrasts watched among the remaining medicines. By the conclusion of early pregnancy, the third treatment once more illustrated the most prominent decay (P<0.05) relative to all other bunches, whereas the moment and fourth medications appeared a noteworthy decrease (P<0.05) compared to the primary treatment.

Table (4): Effect of dosing ewes with aqueous extract of green tea with a mixture of vitamins A and E on AST activity

(IU/ L)

Treatment	Mid-early pregnancy	End of early pregnancy
T1(control)	128.09±1.46 a	134.08±1.48 a
T2 (green tea 100 ml)	124.08±1.92 a	126.34±0.28 b
T3 (green tea 200 ml)	120.00±2.46 b	115.26±2.46 c
T4 (vitamin A and E)	126.06±0.85 a	126.60±0.44 b

Values were Mean ± standard error

The distinct letters inside the same column signify a marked difference among the research groups in the significance level (P≤0.05)

The comes about in Table (5) appeared the foremost significant diminish (P<0.05) within the alanine aminotransferase (ALT) levels within the third test bunch compared to the other medications amid mid-pregnancy. In late and early pregnancy stages, the moment, third, and fourth investigate bunches shown a checked decrease (P<0.05) relative to the control, with no factually noteworthy contrasts watched among them or between the moment and fourth medications.

Table (5) Effect of dosing ewes with aqueous extract of green tea with a mixture of vitamins A and E on ALT activity (IU/ L)

Treatment	Mid-early pregnancy	End of early pregnancy
T1(control)	26.59±0.90 a	29.24±1.16 a
T2 (green tea 100 ml)	24.66±0.51 a	22.09±0.67 b
T3 (green tea 200 ml)	21.16±0.94 b	20.37±0.49 b
T4 (vitamin A and E)	25.00±1.05 a	22.50±1.79 b

Values were Mean ± standard error

The distinct letters inside the same column signify a marked difference among the research groups in the significance level (P≤0.05)

The outcomes of the statistical analysis at Table (6) showed a marked decline (P≤0.05) for the third group compared to the rest of the group, and a marked decline for the two and fourth research groups comparative to the control at serum cholesterol concentration at the mid-pregnancy stage. At the end of early pregnancy, we observed the highest significant decrease (P≤0.05) for the third group compared to the rest of the research groups, a significant decline (P≤0.05) for the second group comparative to the fourth group, and a significant decline for the fourth group comparative to the control.

Table (6) Effect of dosing ewes with aqueous extract of green tea with a mixture of vitamins A and E on serum cholesterol (mg/ 100 mL)

Treatment	Mid-early pregnancy	End of early pregnancy
T1(control)	77.54±1.75 a	77.40±0.92 a
T2 (green tea 100 ml)	66.23±1.95 b	56.77±1.62 c
T3 (green tea 200 ml)	36.63±1.44 c	45.31±1.31 d
T4 (vitamin A and E)	66.58±0.87 b	60.71±1.03 b

Values were Mean ± standard error

The distinct letters inside the same column signify a marked difference among the research groups in the significance level (P≤0.05)

Discussion

The results of the current study are consistent with those obtained by [13], who found that green tea consumption has a positive effect on maintaining blood glucose homeostasis. This effect can be attributed to the improvement of insulin sensitivity, thereby enhancing energy metabolism. The researchers attributed this reduction to the role of polyphenolic compounds (such as EGCG) present in green tea, which in turn enhance insulin sensitivity and inhibit glucose absorption in the intestines. Furthermore, the chemical composition of green tea, rich in phenolic compounds such as catechins, reduces glucose absorption from the intestinal mucosa in cases of both type 1 and type 2 diabetes by inhibiting the activity of the α-glucosidase enzyme. Green tea contains a modest amount of crude protein, along with a notable content of amino acids, especially theanine, which is a unique amino acid comprising a significant portion of the total amino acids in tea [14]. Theanine contributes to the physiological effects of green tea, including its calming and cognitive-enhancing properties [4]. Green tea too contains small amounts of carbohydrates and fats including important fatty acid such as linoleic acid and alpha-linolenic acids [14]. In terms of minerals, green tea provides about 5% minerals including calcium, phosphorus, sodium, iron, potassium, magnesium, magnesium, fluoride, cobalt, and copper [5]. Among these, manganese is the most abundant mineral and plays an essential role at protein metabolism as well as at maintaining healthy bones and connective tissues [15].

Green tea is also a good origin of vitamin, especially vitamin C and vitamin E. Furthermore, it contains purine alkaloids such as caffeine, theophylline, and theobromine, which contribute to its stimulating effect [16]. The leaves

are rich in catechins, a type of polyphenol that acts as a powerful antioxidant and is largely responsible for the health benefits associated with green tea [17]. Green tea includes polyphenolic compounds, including catechin. It also contains flavanols, flavonoids, and Theaflavin, in addition to containing Myricetin, Kaempferol, and Quercetin, as flavonoids, and flavonoids showed shown the effect of green tea as an antioxidant [18]. Experiments conducted showed that catechin, found in green tea, reduces cholesterol levels. It has also been used to accelerate metabolism and burn fat, as its antioxidation impact assists the liver perform its role more effectively. [19]. At a study conducted by [20], which demonstrated the impact of tea in lessening low-density lipoproteins at blood serum and contributes to protection against heart ailment. Research shows that consuming green tea contributes to reducing total cholesterol and triglyceride levels. The intake of green tea also shows a affirmative effect on the balance of blood sugar levels, which can be attributed to the improvement of insulin sensitivity, thereby enhancing energy metabolism [21]. Moreover, flavonoids have an essential part at the part of flavonoids at tea at lessening lipid levels [22]. Vitamins play a major part at the general nutrition of animals [23]. At adult ruminant rations, vitamin A is one of the fat-soluble vitamins, so all flock animals especially cattle need vitamin A for proper nutrition [24]. the period vitamin A includes many compounds such as retinol (alcohol), retinal (aldehyde), and retinoic acid (acid), these compounds, in addition to beta-carotene, are all forms of the vitamin [25]. Vitamin A precursors, carotenoids, are found in food that comes from plants. These carotenoids include three types: alpha-carotene, beta-carotene, and beta-cryptoxanthin [26]. In addition, there is a high incidence of uterine inflammation in animals that suffer from a deficiency in vitamin A [27]. The role of vitamin A is also manifested in stimulating the production of proteins necessary for the process of cell and tissue formation, this function promotes the health of mucous membranes, which helps maintain a healthy balance of the intestine and supports the absorption of nutrients [28]. Vitamin E is a vital stimulant for metabolic processes in the body [29]. Prenatal injection of vitamin E into ewes led to an increase in immunoglobulins in the serum of lambs and a higher weight of lambs compared to lambs in the control group [30]. Vitamin E has multiple physiological effects. Although the mechanism of physiological action is not completely known, most of the biological activities of this vitamin are due to its activity as an antioxidant [31]. It plays an important part at preventing lipid oxidation in biological membranes by reducing free radicals and other oxidizing agents and preventing the formation of peroxides [32]. Vitamin E also helps to reduce the levels of harmful cholesterol and triglycerides in the blood, maintains the selective permeability of the cell wall, which improves the health of cell membranes and reduces oxidative stress caused by environmental or internal conditions such as pregnancy [33]. In addition, it contributes to the improvement of liver function and the reduction of metabolic enzymes associated with stress, and also enhances the immune functioning and nervous functions in animals [34]. These properties make vitamin E an important component of the bush to better the overall health and productive performance of livestock, especially in conditions of stress [35].

Conclusion

The study conducted on local Avassi ewes proved that the administration of aqueous green tea extract (at concentrations of 100 ml/grams and 200 ml/grams) and a mixture of vitamins A (400 IU/kg body weight) and E (200 IU/kg body weight) during the early pregnancy stage significantly improved physiological performance compared to the control set. These results offer that green tea extract and vitamin A-E supplementation may positively influence metabolic processes in ewes, contribute to a more favorable uterine environment and improved embryonic viability in Awassi ewes. more research is warranted to elucidate the underlying mechanisms and long-term effects of these interventions on sheep health and productivity.

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دراسة مقارنة التغيرات الحاصلة في بعض الصفات الفسيولوجية في النعاج العواسية المجرعة بالمستخلص المائي للشاي الأخضر مع خليط فيتامين آ و هـ

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الخلاصة
ركزت الدراسة الحالية على دراسة تأثير إعطاء المستخلص المائي من الشاي الأخضر ومزيج من فيتامين أ و هـ في مرحلة الحمل المبكرة. أُستخدمت في التجربة 20 نعجة أواسي محلية، عمرها عامين ويبلغ متوسط وزنها ***45.30 ± 2*** كغم. تم توزيعه عشوائيا على خمس معاملات، مع خمسة نعجة لكل معاملة. تم تجريع النعاج في معاملة السيطرة بمياه معقمة ونظيفة خالية من المواد المضافة. تم تجريع المعاملة الثانية بمستخلص مائي من الشاي الأخضر بتركيز (100 مل/غرام). تم تجريع المعاملة الثالثة بمستخلص مائي من الشاي الأخضر بتركيز (200 مل / غرام)، وأما نعاج المعاملة الرابعة فقد تم تجريعها بمزيج من فيتامين أ بجرعة (400 وحدة دولية/ كغم من وزن الجسم) وفيتامين هـ بجرعة (200 وحدة دولية/ كغم من وزن الجسم). أظهرت نتائج الدراسة أن هناك فرقا بارزاً في الأداء الفسيولوجي للمجموعات التي تم تناولها بمحلول مائي من الشاي الأخضر وكذلك المجموعة التي تم إعطاؤها مزيجا من فيتامين أ و هـ مقارنة بالمجموعة السيطرة.

الكلمات المفتاحية: العواسي، الشاي الأخضر، فيتامينات، كيموحيوي، مستخلص .