



## The Bio-physiological Impact of Different Concentrations of Ginger Aqueous Extract in Awassi Ewes

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### Abstract

**T**HIS STUDY was conducted to prove the physiological impacts of different concentrations of aqueous extract of ginger on some biochemical traits in mature ewes to find the best concentration to investigate the changes that happened in the physiological parameters of the animal. The study investigated the impact of aqueous extraction of ginger tubers at concentrations of 200, 300, and 400 mg/kg of body weight and depended on these treatments for 20 ewes for two months. The gradual increase in the approved concentrations of the aqueous extract of ginger tubers has also led to a gradual significant increase ( $p \leq 0.05$ ) in the approved biochemical parameters, such as a decrease in blood glucose, an increase in total protein levels and blood albumin concentration, and a decrease in the level of AST and ALT liver enzymes. The results of the current study proved that treating of adult ewes by aqueous extracts of ginger tubers in different concentrations showed gradual important improvement and stability in vital biophysiological traits.

**Keywords:** Ginger, Physiological, extract, traits, Awassi.

### Introduction

Ginger (*Zingiber officinale*) is one of the many medicinal plants used since ancient times in the treatment of many diseases, as well as used as one of the common spices for food and drinks because of its distinctive flavour [1]. Ginger belongs to the ginger family, which grows in hot regions and is characterised by its pungent taste. The part used is the thick tuberous root, which is irregularly branched and is in the form of rhizomes more like potato tubers [2]. Ginger tubers, unlike other medicinal plants, are characterised by having pharmacological and therapeutic properties. The ancient Chinese and Indians used it as an anti-inflammatory, anti-allergen and an active antioxidant [3]. Some studies have also reported that ginger can enhance growth performance, immune response, and improve the blood picture and biochemical and hormonal parameters both in normal and various stress situations [4]. Ginger acts as a blood sugar reducer, and has an effective role in weight loss. Studies have demonstrated that ginger may help diabetics manage their blood sugar levels and increase their sensitivity to insulin [5]. Gingerols and shogaols, two chemicals included in ginger, have demonstrated the ability to

impede important enzymes related to the treatment of type 2 diabetes, including  $\alpha$ -glucosidase and  $\alpha$ -amylase.

Ginger may improve the regulatory and control point for blood glucose, that lead to an increment in glycogen storage in muscles and liver [6]. *Zingibar officinale* acts as vital antioxidant and strong hypoglycaemic and hypolipidemic factor with hepatoprotective properties [7]. Therefore, ginger is represented effective nature herb to control levels of liver antioxidative enzymes especially during oxidative stress [8].

### Material and Methods

Twenty Awassi ewes within about two years in age and about 50 kg weight were depended in current experimental design. There were four groups of ewes, each with five ewes. The treatments were then divided among the groups randomly.

The first control group, T1, administered orally using just distilled water. The T2 group orally dosed with ginger aqueous extract at 200 mg/kg of body weight as a concentration; the T3 group was orally dosed with ginger aqueous extract at 300 mg/kg of

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DOI: 10.21608/EJVS.2024.279035.1965

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body weight as a concentration and the T4 group orally dosed with ginger aqueous extract at 200 mg/kg of body weight as a concentration. The trial of the study took two months.

Ginger roots bought from the local market, washed, dried, and then ground. 10 g of the dry powder of ginger was mixed with 100 ml of distill water with mixed by an electrical mixer for half an hour, then the mixture was filtered using layers of medical gauze and rounded 3000 cycles during 10 minutes in centrifuge, then filtered using filter paper to get rid of impurities. The extract dried in the oven at 40 °C and then kept in the refrigerator until use [9].

The ewes kept in equal-sized, half-closed shelters with dimensions of 5 x 3 m, provided with a forerunner measuring 220 x 35 x 20 cm<sup>3</sup>, and 50 liters of drinking water for each group. At start, mid, and end point of current study, the intervening period was 20 days [10]. 5 ml of blood specimens took from jugular vein site by using sterile syringe.

Blood specimens reset in clean tubes free from anticoagulants and sinistral at 25 °C for 15 minutes [8]. The serum samples then centrifuged for 15 minutes at 3500 rpm. The serum specimens then separated into tiny parts and put in clean test tubes. The data analyzed using the statistical analysis system (SAS) [11], using a complete random design (CRD) [12]. To compare significant means, the Duncan multiple range test was used [13].

## **Results and Discussion**

Statistical analysis data in Table 1 showed no significant variations between ewes of study treatments at the initial stage of the study, while at the midpoint and endpoint of the study, the T3 and T4 groups recorded the significant slightest ( $p \leq 0.05$ ) blood glucose levels in comparing to other groups, while T2 group recorded no significant variations in the slightest glucose levels in comparing with the T1 group. Current study is original research to propose using of ginger aqueous extract on some biophysiological measurements in mature ewes. Reduction in blood glucose concentrations in dosed ewes with an aqueous extract of ginger is consistent with a study by Ademosun *et al.* [14], which referred to the importance of the gingerols, an active substance called gingerols, that play a critical role in decreasing resistance of insulin, decreasing glucose and insulin concentration, increasing adiponectin formation, and impacting sugar homeostasis. The active compounds in ginger might mimic the action of insulin, causing cells to absorb glucose more effectively. This can lead to lower blood sugar levels. Ginger may improve how your body responds to insulin, making it more effective at lowering blood sugar [15]. This could involve mechanisms like increasing the expression of the GLUT4 transporter protein, which helps cells take up glucose [16].

Gingerol may inhibit the activity of alpha-glucosidase, an enzyme involved in carbohydrate digestion. This could potentially slow down glucose absorption in the intestines and prevent blood sugar spikes after meals [17].

Results in Table 2 showed that there were no important variations between treatments at the start of study. At the midpoint of the study period. T4 and T3 groups recorded important increasing ( $p \leq 0.05$ ) in total protein concentrations in comparing to control, while there were calculated but not significant differences between the T3 and T2. At the experimental endpoint, total protein concentration in all treated groups displayed a significant increase ( $p \leq 0.05$ ) in comparing to control group, while no important differences were recorded between T3 and T4. Observed elevation in blood protein concentrations in the T3 and T4 groups agreed with Al-Dain and Jarjis [18], Al-Azazi *et al.* [19], and Abo Bakr [20], who observed statistically important increases ( $P < 0.05$ ) in total protein levels after the administration of ginger powder. The observed elevation in blood protein levels in the second group may be attributed to its capacity to stimulate nutrient absorption from the intestine, including vital amino acids, and enhance the efficiency of the digestive system. Ginger, being one of the herbs known to enhance digestion and absorption, likely contributes to this effect [21]. Additionally, ginger contains several antioxidant compounds that can scavenge free radicals and minimise oxidative stress. Oxidative stress can also affect blood proteins, leading to modifications in their structure and function. By reducing oxidative stress, ginger may help maintain proper blood protein levels [22].

Results in Table 3 didn't reveal any discernible variations in the experiment's coefficient rates between starting and middle stage of experiment. However, by examining the blood albumin levels in the treatment groups, it was noted that the T4 treatment recorded highest rates ( $p \leq 0.05$ ) in comparing to other groups, followed by the T3 compared to the T2 and T1 groups, while T2 group, in turn, recorded significant increase ( $p \leq 0.05$ ) at its albumin averages in comparing to T1. Ginger provincially interrelates with the membranes of lipids and albumin. Amalgamation of ginger with albumin actuate the property of water solubility, that promotes development of cells in the stages of growth of creating nearly all the albumin that is founded in blood plasma [23].

This illustrates the reduction in albumin and total protein levels in blood, particularly at last third of study, such as shown in Tables 4 and 3. Immediacy of bonds of hydrogen and hydrogen acceptors in peptides bond may progress when the ginger molecule contains Phenolic hydrogen groups function as hydrogen donors [24]. Both in solution and free form, creation of folate complexes of human

serum or bovine albumin is examined [25]. Rulings intimate that inclusion of folate, especially at elevated dosages, could be adapt the structure of proteins by relatively expanding them. The serum albumin of bovine literature showed same rulings [26]. These rulings were negotiated with Al-Dain and Jarjeis [18].

AST averages in study groups didn't find important variations between them during the start of study. Even though at midpoint of study, T4 group averages found important reduction ( $p \leq 0.05$ ) in comparing to the T1 averages and only a mathematical decrease in comparing to T3 and T2 groups. Upon completion of the research, even though the T3 and T2 groups showed an important reduction ( $p \leq 0.05$ ) in AST values in comparing to T1 group. Mixture of ginger-folate group illustrated slightest important reduction ( $p \leq 0.05$ ) in AST averages in comparing to all study treatments.

The results in Table 5 indicated no discernible variation between study groups at start of current study. At the halfway point of study time, rates of T2 group are significantly decreased ( $p \leq 0.05$ ) in comparison to T1, and the T4 group's ALT averages significantly decreased ( $p \leq 0.05$ ) in comparing to the other treatments. At end of study, in spite of no variation between the T3 and T2 ALT averages, their averages showed a significant reducing in comparing to first group, while ALT average of T4 revealed slightest reducing ( $p \leq 0.05$ ) in compared to ALT averages in the experiment. Turmeric augmentation significantly led to a decrease in AST and ALT levels in the current experiment.

All around, current findings suggest that oral administration of ginger aqueous extract might decrease ALT and AST concentrations in blood serum. Ginger is one of the most effective medicinal plants that improve, assist, and safeguard liver enzyme functions [27].

Ginger plays an important role as an anti-oxidative factor, prevents lipid peroxidation, defends against acute and chronic inflammations, and promotes insulin resistance in skeletal muscles by

encouraging the oxidation of glucose and fatty acids [28]. Ginger revealed in vitro and in vivo blocking of the signalling of leptin, control of the content of intracellular glucose and metabolism of lipids, and maintaining equilibrium of production and deterioration of the hepatic extracellular matrix to prevent formation of active liver stellate cells [29].

Ginger suppresses hepatic stellate cell activation by reducing the signalling of leptin, administering intracellular metabolism of fats and carbohydrates, and regulating production and breakdown of extracellular matrix of liver [30]. The antioxidant and detoxifying efficacy will be promoted by folic acid's potency, as well as liver enzyme levels stabilizing with folate intake [31]. Furthermore, the antioxidant effectiveness of folic acid against reactive oxygen species (ROS), it is also one of its vital activities in liver cells [32].

### **Conclusions**

The results of the current study concluded that dosing of aqueous extracts of ginger tubers at a concentration led to gradual and significant changes in the Awassi sheep's biophysiological qualities. The conclusions section should come in this section at the end of the article, before the acknowledgements.

### *Acknowledgment*

Authors of current study would like to thank head of animal production department, deanship of college of agriculture of Kirkuk University for providing facilities in department field to compete the research.

### *Conflicts of interest*

There are no conflicts to declare.

### *Funding statement*

The study was funded in terms of the provision of ewes and the place of the experiment at the expense of the department of animal production and the other costs were paid from the personal account of the researchers.

**TABLE 1. Impact of ginger aqueous extract and folate on blood glucose (mg/100 ml)**

Treatments	Initial stage of an experiment	The experiment midpoint	The experiment endpoint
T1	1.27 ± 74.38 <sup>a</sup>	2.01 ± 73.41 <sup>a</sup>	71.7 ± 1.3 <sup>a</sup>
T2	1.24 ± 75.71 <sup>a</sup>	66.28 ± 1.34 <sup>a</sup>	65.29 ± 1.2 <sup>a</sup>
T3	1.71 ± 77.25 <sup>a</sup>	52.41 ± 1.18 <sup>b</sup>	51.5 ± 1.29 <sup>b</sup>
T4	1.82 ± 76.09 <sup>a</sup>	43.31 ± 1.47 <sup>c</sup>	40.71 ± 0.97 <sup>c</sup>

**TABLE 2. Impact of ginger aqueous extract and folate on total protein (gm/100 ml)**

Treatments	Initial stage of an experiment	The experiment midpoint	The experiment endpoint
T1	5.59 ± 0.78 <sup>a</sup>	5.71 ± 1.24 <sup>a</sup>	5.13 ± 1.07 <sup>a</sup>
T2	5.54 ± 1.12 <sup>a</sup>	5.62 ± 1.51 <sup>ab</sup>	5.87 ± 1.23 <sup>a</sup>
T3	5.60 ± 1.29 <sup>a</sup>	6.37 ± 1.69 <sup>bc</sup>	6.88 ± 1.41 <sup>b</sup>
T4	5.73 ± 0.88 <sup>a</sup>	6.81 ± 1.58 <sup>c</sup>	7.82 ± 1.81 <sup>c</sup>

Mean ± standard error. Different small letters at same column reveal significant variations at expectation threshold of 0.05%. T1 control group No-addition, T2 treated by 200 mg/kg of body weight aqueous extract of ginger; T3 treated by 300 mg/kg of body weight ginger aqueous extract; and T4 treated by 400 mg/kg of body weight aqueous extract of ginger.

**TABLE 3. Impact of ginger aqueous extract and folate on serum albumin (gm/100 ml)**

Treatments	Initial stage of an experiment	The experiment midpoint	The experiment endpoint
T1	2.41 ± 0.29 <sup>a</sup>	2.55 ± 0.51 <sup>a</sup>	2.37 ± 0.81 <sup>a</sup>
T2	2.33 ± 0.72 <sup>a</sup>	2.39 ± 1.02 <sup>a</sup>	2.68 ± 0.94 <sup>b</sup>
T3	2.29 ± 0.45 <sup>a</sup>	2.44 ± 1.09 <sup>a</sup>	3.48 ± 1.1 <sup>c</sup>
T4	2.35 ± 0.38 <sup>a</sup>	2.57 ± 1.11 <sup>a</sup>	4.01 ± 1.25 <sup>d</sup>

Mean ± standard error. Different small letters at same column reveal significant variations at expectation threshold of 0.05%. T1 control group No-addition, T2 treated by 200 mg/kg of body weight aqueous extract of ginger; T3 treated by 300 mg/kg of body weight ginger aqueous extract; and T4 treated by 400 mg/kg of body weight aqueous extract of ginger.

**Table 4. Impact of different concentration of ginger aqueous extract and folate on AST**

Treatments	Initial stage of an experiment	The experiment midpoint	The experiment endpoint
T1	21.44 ± 1.19 <sup>a</sup>	20.58 ± 0.94 <sup>a</sup>	20.17 ± 1.21 <sup>a</sup>
T2	20.27 ± 0.92 <sup>a</sup>	18.64 ± 1.08 <sup>ab</sup>	16.11 ± 0.74 <sup>b</sup>
T3	22.13 ± 0.57 <sup>a</sup>	18.37 ± 1.14 <sup>ab</sup>	16.21 ± 1.11 <sup>b</sup>
T4	21.42 ± 0.79 <sup>a</sup>	17.50 ± 1.01 <sup>b</sup>	14.07 ± 1.2 <sup>c</sup>

Mean ± standard error. Different small letters at same column reveal significant variations at expectation threshold of 0.05%. T1 control group No-addition, T2 treated by 200 mg/kg of body weight aqueous extract of ginger; T3 treated by 300 mg/kg of body weight ginger aqueous extract; and T4 treated by 400 mg/kg of body weight aqueous extract of ginger.

**Table 5. Impact of different concentration of ginger aqueous extract and folate on ALT**

Treatments	Initial stage of an experiment	The experiment midpoint	The experiment endpoint
T1	23.44 ± 1.22 <sup>a</sup>	22.75 ± 1.12 <sup>a</sup>	21.67 ± 1.41 <sup>a</sup>
T2	22.21 ± 0.74 <sup>a</sup>	19.41 ± 0.88 <sup>b</sup>	16.18 ± 1.23 <sup>b</sup>
T3	23.42 ± 0.90 <sup>a</sup>	20.50 ± 1.31 <sup>ab</sup>	17.01 ± 1.31 <sup>b</sup>
T4	22.40 ± 1.19 <sup>a</sup>	16.28 ± 1.42 <sup>c</sup>	14.27 ± 1.36 <sup>c</sup>

Mean ± standard error. Different small letters at same column reveal significant variations at expectation threshold of 0.05%. T1 control group No-addition, T2 treated by 200 mg/kg of body weight aqueous extract of ginger; T3 treated by 300 mg/kg of body weight ginger aqueous extract; and T4 treated by 400 mg/kg of body weight aqueous extract of ginger.

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### الأثر الفسيولوجي الحيوي لتراكيز مختلفة من المستخلص المائي للزنجبيل في النعاج العواسي

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#### المستخلص

أُجريت هذه الدراسة لإثبات التأثيرات الفسيولوجية لاستخدام تراكيز مختلفة للمستخلص المائي للزنجبيل على الصفات الكيموحية في النعاج البالغة وإيجاد التركيز الأمثل الذي يُظهر التغييرات الحاصلة في القياسات الفسيولوجية في الحيوانات. تَحَرَّت الدراسة استخدام التراكيز 200، 300 و 400 ملغم/كغم من وزن الجسم من المستخلص المائي لدرنات الزنجبيل والتي تم اعتمادها على 20 نعجة ولمدة شهرين. إن اعتماد التراكيز المتدرجة للمستخلص المائي لدرنات الزنجبيل قد أدى لحصول زيادة معنوية متدرجة في الصفات الكيموحية المعتمدة كإنخفاض مستويات سكر الدم وزيادة تراكيز البروتين الكلي واليوميين الدم، وانخفاض مستويات إنزيمات الكبد. أثبتت نتائج الدراسة الحالية من أن معامل النعاج البالغة بتراكيز مختلفة من المستخلص المائي لدرنات الزنجبيل قد أدى إلى حصول تحسن معنوي وثباتيه في الصفات الفسيولوجية الحيوية.

**الكلمات الدالة:** الزنجبيل، فسيولوجية، مستخلص، صفات، النعاج العواسي.