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Effect of addition of ginger (*Zingiber officinale*) and vitamin E on level of cortisol, ADA enzyme and liver enzymes in Awassi ewes

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Abstract. The study was conducted to know the effect of different levels of ginger and vitamin E on levels of cortisol, ADA, ALP, GGT, AST, and ALT. Twenty five Awassi ewes were used, aged between 2-5 years and body weight of 37.5 Kg, presented in the animal production farm which belonged to the agricultural college, university of anbar. The experiment was continued for two months. The animals were divided into five groups each group contained five animals. The first group (T1) was not treated and serve as a control. The 2nd (T2), Third (T3), and the 4th (T4) group were treated with ginger 10,15 and 20 gm respectively three times per week while the 5th group treated with 500 mg of vit. E three times per week for each ewe. Blood samples were collected at day 15, 30, 45 and 60 of the experiment. The results showed that there was a significant increase ($P \leq 0.05$) in the level of cortisol in the control group during all period (15, 30, 45, 60) of the experiment while T4 and T5 showed a significant decrease ($P \leq 0.05$) in the level during all periods of the experiment. The results also showed a significant increase ($P \leq 0.05$) in the ADA enzyme in T4 and T5 during the period of the study, while T2 and T3 showed a significant decrease ($P \leq 0.05$) in the level at day 15 and 30 of the experiment, The control group showed significant decrease ($P \leq 0.05$) in ADA level at day 45 and 60 of the experiment, The measurement of ALP enzyme showed a significant increase in T4 and T5 ($P \leq 0.05$) during the period of the experiment, while the control group showed a significant decrease ($P \leq 0.05$) in its level during the period of experiment, Enzymes levels of GPT, GOT and GGT showed a significant increase ($P \leq 0.05$) in control group as compared with other treatment groups. T4 showed a significant decrease ($P \leq 0.05$) during the periods of the experiment. It was concluded from this study that the use of 20 gm of ginger and 500mg of vit. E plays an important role in increase immunity of the body through improvement of hormone stasis and increase ability to eradicate bacteria and causes of diseases through decrease a catabolism in cellular tissue of the different system of the body.

1. Introduction

In the last decade it has been concentrated on some of medical plants or apart of its content on productive performance of the animals, and its effect on blood picture, hormones and immunity and the physiological condition of the animal. It has been found that there was some of plants having a certain chemical structures could be used for treatments, throw its seeds or roots, such of these plants which have a positive effect was *zingiber officinal* that have an active role in improvement of digestion and reduce blood clot. It's also help in treatment of some microbes that infect the body and reduce the productive performance of the animal [1, 2, 3, 4]. The root of ginger is important in improvement of intestinal function due its content of phenols and other volatile oils that remove gases and help in digestion [5].

[6] observed that ginger root had an ability to treat same of body cancer like renal cancer without any effect on healthy cells of the kidney. [7] explained that ginger have anti parasitic action in sheep and



has no side effect and no resistant as it occurs to the antibiotics. The ginger contained a high percent of Fe, Mg, Ca, Vit. C, flavonoids and phenols.(gingerdio, gingerol, gingerdione, shogalos, sesquiterpenes and paradols) that enables it to have several biological activities such as treatments of flue, anti-inflammatory, prevent cell damage, anti-cancer, antipyretic, antiplatelet collections, reduce blood sugar, antioxidant, anti-blood clot., pain relief, cardiac stimulant, having antibacterial activity, anti-rheumatic, and reduce blood pressure [8]. ginger reduce the observation of cholesterol and decrease its concentration in the blood serum. Various ginger extracts tend to decrease oxidation of low lipoprotein (LDLP). The ginger contains zingerone, gingerol, and gengeriorol which are a compound having similar activity of vitamin E to prevents oxidation and improved blood characteristics [9].

New studies showed that the flavonoids present in the ginger extract considered as a good source of antioxidant that protect biological molecules from various health problems such as diabetes, different inflammation and blood clot and reduce the stress of anti-oxidation [4]. The ginger has the ability to inhibit several types of bacteria that infect human and reduce their resistance to the antibiotics [10].

The aim of this study was to know the effect of addition of ginger in different levels and Vit.E on blood levels of cortisol, ADA enzyme and liver enzymes in Awassi ewes.

2. Materials and Methods

The study was carried out on 25 Awassi ewes, Aged between 2-5 years, with a body weight of 37±5 kg, presented in animal production farm, college of agriculture, Anbar University. The animal was examined to be out of disease and given ant parasitic drug for external and internal parasite and vaccinated against brucellosis. The animals were divided into 5 equal groups (each group contain 5 animals). The first group (T1) were not treated and serve as a control. The 2nd, 3rd and 4th group (T2, T3, T4) were given ginger at a rate of 10,15, and 20 gm with the ration. while the 5th group (T5) were given 500mg from vit. E. all the treatments were given three times per a week for each ewes. Blood samples were collected via jugular vein puncture at day 15,30,45 and 60 of the experiment. the samples transferred to the lab. And the following parameters were measured;

- The method of cortisol measurement: serum blood cortisol was measured using ELISA according to the method of [11] which was described by the special kits (DRG Co. Germany).
- Measurement of activity of Adenosine Deaminase (ADA) immune enzyme in blood serum samples; The test was done according to the method described by [12].
- Measurement of Alkaline phosphatase enzyme (ALP): The activity of ALP enzyme was measured according the kits manufactured by BioMereux CO., France. According to the method of [13].
- Measurement of transaminase group enzymes AST and ALT: The method of [14] were used for measurement.
- Measurement of GGT was done according the kits manufactured by Biolab. CO., France. According to the method of [15] 30ml from serum sample and put on special tape for measurement the conc. Of GGT enzyme in its special place the tape then put in the Reflotrone system for about 2 minutes and then reading the conc. Of GGT.

The results were statistically analyzed in one way which includes effect of treatment in different period (15, 30, 45, 60 day) using general linear model with application of SAS program [16]. The significant difference between means values of the parameters according to the Duncan multiple range test at ($P \leq 0.05$) [17].

3. Results and Discussion

The results showed (Table 1) the effect of ginger on cortisol level in blood serum of sheep. There was significant increase ($P \leq 0.05$) in cortisol level in control group during the period of study as compared with other groups. While group treated with Vit. E showed (T5) a significant decrease ($P \leq 0.05$) in cortisol during all periods of the study. T4 and T5 showed no differences significantly during the experiment.

The increase in the level of cortisol in control group (T1) might be due to infection with certain diseases that required stimulation of immune system kill the causative agent. This may lead increase

cortisol level to activate the work of immune cells and increase the level of sensitivity at early stage. It is also ginger plays an important role in resolution of mucus membranes lined different systems that leads to decrease cortisol levels in ginger and Vit. E treatment [18], or it might be due to food consumed by the animal participate in anabolism and resolution of tissues and also anabolism of different organs of immune system as a result of treatment with ginger that leads to decrease in secretion of body cortisol [5].

Table 1. Effect of ginger on Cortisol hormone (microgram/dl) in the blood serum of sheep

| Period | Treatments | | | | | P-value |
|---------|------------------|-------------------|-------------------|-------------------|-------------------|---------|
| | T1 | T2 | T3 | T4 | T5 | |
| 15 days | 61.9 ± 1.12 a | 55.2 ± 1.85 b | 51.6 ± 0.640 b | 45.9 ± 1.61 c | 43.3 ± 0.898 c | 0.0001 |
| 30 days | 66.7 ± 1.68 a | 52.7 ± 1.10 b | 50.7 ± 0.554 b | 45.5 ± 1.14 c | 41.7 ± 0.795 d | 0.0001 |
| 45 days | 71.9 ± 2.60 a | 52.6 ± 0.941 b | 52.6 ± 2.47 b | 47.2 ± 1.02 b | 41.6 ± 0.964 c | 0.0001 |
| 60 days | 70.4 ± 1.56 a | 51.6 ± 1.15 b | 53.4 ± 1.99 b | 46.5 ± 0.823 c | 42.4 ± 1.06 d | 0.0001 |

* Means ± Standard Error.

a, b, c: means in the same Rows with different superscripts differ significantly at probability value ($P \leq 0.05$).

The results showed in the (Table 2), that the measurement of ADA enzyme showed a significant increase in T5 ($P \leq 0.05$) during the periods of study (15, 30, 45 and 60 days), T2 showed the low level at the day 15. While T3 showed the low level at day 30. T1 showed the lowest level of ADA at day 45 and 60 ($P \leq 0.05$).

The results showed that an increase in ADA in ginger and Vit. E treatments might be due to their mechanism of action to enhance the immune system and provide the immune response against the causative agent of some diseases. This leads to increase the level of ADA, and via versa the level of ADA decrease in control group [19] as a results of significant improvement of ADA due to addition of different levels of ginger and Vit. E might be due to the presence of active substances in ginger and Vit. E to improve immune response of animals.

Table 2. Effect of ginger on ADA enzyme (IU/L) in the blood serum of sheep

| Period | Treatments | | | | | P-value |
|---------|-------------------|------------------|-------------------|-----------------|------------------|---------|
| | T1 | T2 | T3 | T4 | T5 | |
| 15 days | 73.2 ± 0.967 d | 84.1 ± 1.52 c | 87.0 ± 0.299 c | 116 ± 1.75 b | 124 ± 2.50 a | 0.0001 |
| 30 days | 74.1 ± 0.900 d | 86.1 ± 1.14 c | 84.0 ± 1.48 c | 123 ± 1.85 b | 128 ± 0.971 a | 0.0001 |
| 45 days | 75.5 ± 0.907 d | 84.3 ± 1.47 c | 86.3 ± 0.862 c | 124 ± 2.38 b | 130 ± 1.56 a | 0.0001 |
| 60 days | 77.3 ± 1.03 c | 84.1 ± 1.39 b | 84.7 ± 1.11 b | 125 ± 1.62 a | 127 ± 1.21 a | 0.0001 |

* Means ± Standard Error.

a, b, c: means in the same Rows with different superscripts differ significantly at probability value ($P \leq 0.05$).

The results of ALP enzyme (Table 3) showed a significant increase ($P \leq 0.05$) in T4 and T5 during the period of the experiment while the T1 (control) showed a significant decrease ($P \leq 0.05$) in its level during the period of experiment.

The results of measurements of ALP enzyme there was a significant increase ($P \leq 0.05$) in ginger and Vit. E treated groups, while the control group showed lowest significant level. This might be due to the ability of ginger and Vit. E as antioxidant to remove the free radicals which leads to resolution of bile duct mucus membrane and liver tissue that increase the level of this enzyme [20], or it might be due to the improvement of metabolic rate in the liver that increase the enzyme level as end product of metabolism [21].

Table 3. Effect of ginger on ALP enzyme (IU/L) in the blood serum of sheep

| Period | Treatments | | | | | P-value |
|---------|---------------------------|-------------------------|--------------------------|-------------------------|-------------------------|---------|
| | T1 | T2 | T3 | T4 | T5 | |
| 15 days | 123 ± 2.44 ^e * | 166 ± 1.87 ^d | 187 ± 1.53 ^c | 236 ± 2.95 ^b | 252 ± 1.77 ^a | 0.0001 |
| 30 days | 129 ± 2.50 ^d * | 176 ± 1.85 ^c | 191 ± 1.14 ^b | 246 ± 1.73 ^a | 248 ± 2.63 ^a | 0.0001 |
| 45 days | 132 ± 2.08 ^d * | 181 ± 2.31 ^c | 194 ± 1.62 ^b | 249 ± 3.82 ^a | 250 ± 4.09 ^a | 0.0001 |
| 60 days | 127 ± 2.71 ^d * | 182 ± 1.28 ^c | 193 ± 0.823 ^b | 251 ± 1.76 ^a | 250 ± 1.88 ^a | 0.0001 |

* Means ± Standard Error.

a, b, c: means in the same Rows with different superscripts differ significantly at probability value ($P \leq 0.05$).

(Table 4) showed the effect of ginger and Vit. E on the level of GGT enzyme in serum of sheep. The results showed a significant increase ($P \leq 0.05$) in T1 while showed a significant decrease ($P \leq 0.05$) in T4 during the periods of study (15, 30, 45, 60 day).

Table 4. Effect of ginger on GGT enzyme (IU/L) in the blood serum of sheep

| Period | Treatments | | | | | P-value |
|---------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------|
| | T1 | T2 | T3 | T4 | T5 | |
| 15 days | 63.1 ± 0.842 ^a | 54.8 ± 1.03 ^b | 42.6 ± 1.00 ^c | 24.6 ± 1.17 ^d | 43.8 ± 0.520 ^c | 0.0001 |
| 30 days | 61.9 ± 1.23 ^a | 51.9 ± 0.839 ^b | 42.2 ± 0.577 ^c | 23.3 ± 0.873 ^d | 41.5 ± 0.649 ^c | 0.0001 |
| 45 days | 61.5 ± 1.12 ^a | 49.1 ± 0.371 ^b | 44.0 ± 0.434 ^c | 22.9 ± 0.765 ^e | 39.7 ± 0.585 ^d | 0.0001 |
| 60 days | 61.9 ± 1.71 ^a | 49.5 ± 0.343 ^b | 42.7 ± 0.654 ^c | 17.5 ± 0.969 ^e | 36.2 ± 0.510 ^d | 0.0001 |

* Means ± Standard Error.

a, b, c: means in the same Rows with different superscripts differ significantly at probability value ($P \leq 0.05$).

(Table 5) showed the effect of ginger and Vit. E on AST enzyme level in serum of sheep. There was a significant increase ($P \leq 0.05$) in T1 as compared with other groups in AST level while T4 and T5

showed the lowest levels during the day of experiment. There was no significant difference between different other groups.

Table 5. Effect of ginger on AST enzyme (micromole/L) in the blood serum of sheep

| Period | Treatments | | | | | P-value |
|---------|-----------------|------------------|-------------------|-------------------|-------------------|---------|
| | T1 | T2 | T3 | T4 | T5 | |
| 15 days | 119 ± 1.32 a | 86.5 ± 2.05 b | 85.3 ± 2.59 b | 50.1 ± 1.35 c | 45.9 ± 1.73 c | 0.0001 |
| 30 days | 113 ± 6.10 a | 81.6 ± 2.35 b | 78.6 ± 1.20 b | 40.7 ± 1.00 c | 40.9 ± 1.17 c | 0.0001 |
| 45 days | 116 ± 2.31 a | 81.7 ± 1.23 b | 76.9 ± 2.00 c | 40.5 ± 0.713 d | 41.1 ± 0.714 d | 0.0001 |
| 60 days | 108 ± 3.86 a | 82.5 ± 2.63 b | 78.7 ± 0.448 b | 39.9 ± 0.453 c | 41.2 ± 0.848 c | 0.0001 |

* Means ± Standard Error.

a, b, c: means in the same Rows with different superscripts differ significantly at probability value ($P \leq 0.05$).

The effect of ginger and Vit. E on the level of ALT enzyme in the serum of sheep are showed in (Table 6). There was a significant increase ($P \leq 0.05$) in T1 in the level of ALT as compared with other groups while T4 showed the lowest level ($P \leq 0.05$) during the period study.

Table 6. Effect of ginger on ALT enzyme (micromole/L) in the blood serum of sheep

| Period | Treatments | | | | | P-value |
|---------|------------------|-------------------|--------------------|-------------------|-------------------|---------|
| | T1 | T2 | T3 | T4 | T5 | |
| 15 days | 30.7 ± 1.04 a | 24.8 ± 0.780 b | 22.1 ± 0.825 b | 16.2 ± 0.801 c | 22.3 ± 2.12 b | 0.0001 |
| 30 days | 29.8 ± 1.21 a | 25.2 ± 0.332 b | 23.2 ± 0.656 bc | 16.0 ± 0.516 d | 21.7 ± 1.30 c | 0.0001 |
| 45 days | 29.4 ± 1.38 a | 25.3 ± 0.541 b | 23.0 ± 0.666 b | 13.2 ± 0.638 d | 20.4 ± 0.708 c | 0.0001 |
| 60 days | 29.9 ± 1.15 a | 25.2 ± 0.970 b | 23.3 ± 0.997 bc | 12.7 ± 0.694 d | 20.5 ± 1.70 c | 0.0001 |

* Means ± Standard Error.

a, b, c: means in the same Rows with different superscripts differ significantly at probability value ($P \leq 0.05$).

The results showed an increase in the levels of enzymes (GGT, AST and ALT) significantly in the control group and a decrease in the other treated group. Similar observation has been observed by several workers that there was an indication of a damage in liver tissue and other parts of digestive system that leads to increase in the levels of serum enzymes. The treated group with ginger and Vit.E participate in resolution of tissue and treatment of some problems like disease infection that leads to some tissues damage due to stimulation of immune system that cause a reduction in the levels of these enzymes [22].

4. Conclusion

It was concluded from this study that the use of 20gm of ginger and 500mg of Vit. E in the ration of Awassi ewe increase immune response and have beneficial effect on levels of cortisol, ADA and liver enzymes.

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