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EFFECT OF ADDITION OF DIFFERENT LEVELS OF GINGER (*ZINGIBER OFFICIALE*) AND VITAMIN E TO THE RATIONS OF AWASSI EWES ON SOME BLOOD TRAITS

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ABSTRACT : The study was undertaken to compare the effect of addition of different levels of ginger and vitamin E **to the ration cellular and biochemical blood characteristics in Awassi ewes. The experiment was conducted on Awassi ewes, aged between 3-4 years with a mean weight 37±5 kg, presented in the private farm in Ramadi, Anbar. The animals were divided into five groups (5 ewes for each group). The first group (T_1) not treated serve as a control, second (T_2), the third group (T_3) and the fourth group (T_4) were treated with 10, 15 and 20 gm from ginger three times weekly for each ewe. While, the fifth group (T_5) treated with 500mg vitamin E three times weekly for each ewe, blood samples were collected at day 15, 30, 45, 60 of the experiment. The results showed that there was a significant increase in pcv %, Hb %, the numbers of RBCs, WBC, lymphocytes and platelets in T_4 during all the periods. While, the biochemical characteristics of serum showed a high significant value of total protein and globulins for T_4 and T_5 in the most of the periods. Fourth treatment showed significant decrease on the values of glucose, cholesterol and urea at all periods except the value of cholesterol at the first period. The result showed there was no significant difference in the concentration of albumin between different treatment at all periods. It was concluded that the ginger and vitamin E have beneficial effect on blood traits in the ewes.**

Key words : Ginger, vitamin E, Awassi ewes, blood traits.

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INTRODUCTION

The most important things for animal physiologist was to keep the animal Hemostasis, which means that all body organs showed normal function that leads to more productive performance. As a results of unsuitable environmental and managemental conditions that the animal suffering from it which may leads to deviation in animal body homeostasis, causing a disturbance in productive performance. In order to correct this deviation, it showed improve a good environmental and managemental conditions. One of these improvement by a researchers was to use herbal additives to diet which considered as antioxidant and antimicrobial or it may have a role to provide some of nutritive elements or it may play a role similar to hormones and enzymes (Lemma and Egza, 2019). The ginger (*Zingiber officinale*) regarded as one of herbal plants have an active effect on biological activity on animal body (Shahrajabian *et al*, 2019). Ginger contained a natural substances accepted by the body without side effects, it improves the digestive enzyme activity such as; Amylase, Lipase and trypsin (srinivagen, 2003; Rahman *et al*, 2016). It is also reducing of intestinal wall irritation, removal of gases and stimulate digestion in cattle (Pakashi, 2003). Ginger acts to increase of bile secretion which is important for fat digestion (Mabey, 1988). On the other hands, 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 (Mao *et al*, 2019; Anwar *et al*, 2020). This study was aimed to show the effect of different levels of ginger powder and vitamin E on blood characteristics of Awassi ewes.

MATERIALS AND METHODS

The study was conducted to compare the effect of addition of different levels of ginger (*Zingiber officinal*) with the vitamin E to the ration on cellular and biochemical blood traits in Awassi ewes. The study was carried out on 25 Awassi ewes, aged between 3-4 years, with a mean weight of 37±5 kg, presented in the private farm in Ramadi-Anbar , during a period of two months. The ewes were feed on hay with straw addlibitum with a mean of concentrate 400 gm daily. The ewes were treated with ant parasite drug for external and internal parasite and vaccinated against Brucellosis. The ewes were divided into five groups (5 ewes for each group). The first group (T_1) not treated and as a control one. The second (T_2), the third group (T_3) and the fourth group (T_4) were treated with 10, 15, 20 gm from ginger three times weekly for each ewe, respectively, while the fifth group (T_5) treated with 500mg from vit. E three times weekly for each ewe. Blood samples were collected via jugular vein at day 15, 30, 45 and 60 of the experiment to measure the following parameters: complete blood picture; measurement of red blood cells count according to lewis and daue (1974), white blood cells (WBC) according to Joha and Lewis (1984), packed cell volume (PCV) according to Lewis and Daue (1974), Hemoglobin (Hb%), blood platelets according to Schalm *et al* (1975) and the lymphocytic cells according to Seiverd (1973). Parameters of some blood biochemistry: The measurement of cholesterol according to Tietz (1995) and glucose according to Kopper (1975), measurement of total protein and albumin according to the analytical Kitts manufactured by biolab Co. France and according to the guide of the kit. Globulins were measured according to the method of Freeman and Wotton (1974), which described by Bishop *et al* (2000). The urea was measured according to Freem and Wotton (1974). Statistical analysis was done using one-way analysis and the use of SAS program (SAS, 2002) 9.1. Also multiple range test were applied (Duncan, 1955). 5% level of significant were use between different values (P≤0.05).

RESULTS AND DISCUSSION

The results showed in Table 1 that at the first period (day 15). There was a significant increase (P≤0.05) in all treated groups as a compared with the control one in the cellular traits of the blood (PVC, HB, RBC, WBC, lymphocytes and blood platelets) numbers, Treatment number four (T_4) showed the highest significant values (P≤0.05) for these traits. The concentration of serum total protein and globulin showed significant increase (P≤0.05) in all treated groups as a compared with Control one, but T_4 and T_5 showed a high significant value

Table 1 : Effect of ginger in blood tests of ewes at 15 days of experiment.

Tests	Treatments					*P*-value
	T_1	T_2	T_3	T_4	T_5	
PCV%	22.4 ± 0.278*d	24.3 ± 0.205c	27.8 ± 0.379b	31.3 ± 0.299a	30.6 ± 0.405a	0.0001
Hb%	7.48 ± 0.146c	8.45 ± 0.101b	8.34 ± 0.088b	10.8 ± 0.107a	10.5 ± 0.132a	0.0001
RBC (million/ml^3)	6.36 ± 0.260d	8.18 ± 0.093c	8.96 ± 0.187bc	10.73 ± 0.480a	9.84 ± 0.554ab	0.0001
WBC (thousand/ml^3)	13.31 ± 0.681d	20.68 ± 0.582c	26.44 ± 0.766b	31.22 ± 0.720a	27.17 ± 1.06b	0.0001
Lymphocyte (thousand/ml^3)	5.98 ± 0.214e	20.11 ± 0.897d	26.01 ± 0.536c	31.05 ± 0.393a	27.72 ± 0.461b	0.0001
Platelets (thousand/ml^3)	434 ± 12.0c	504 ± 5.03b	515 ± 2.23b	551 ± 4.00a	549 ± 4.07a	0.0001
Cholesterol (mg/dl)	17.1 ± 0.366	17.1 ± 0.335	16.8 ± 0.216	16.4 ± 0.481	17.4 ± 0.453	N.S.**
Glucose (mg/dl)	76.1 ± 0.628a	67.9 ± 0.476b	64.9 ± 1.13c	54.4 ± 1.42d	68.9 ± 0.855b	0.0001
Urea (mg/dl)	67.4 ± 1.73a	66.1 ± 1.15a	53.6 ± 1.22b	51.0 ± 0.359b	67.8 ± 1.26a	0.0001
Protein (gm/dl)	4.99 ± 0.071c	5.34 ± 0.040b	5.46 ± 0.074b	6.05 ± 0.096a	6.09 ± 0.096a	0.0001
Albumin (gm/dl)	2.94 ± 0.099	2.92 ± 0.090	2.97 ± 0.105	2.86 ± 0.121	3.00 ± 0.047	N.S.
Globulin (gm/dl)	2.05 ± 0.133c	2.42 ± 0.093b	2.48 ± 0.121b	2.99 ± 0.085a	3.09 ± 0.140a	0.0001

* Means ± Standard Error.** N.S.: Non-Significant.a, b, c: means in the same Rows with different superscripts differ significantly at probability value (P≤0.05).

Table 2 : Effect of ginger in blood tests of ewes at 30 days of experiment.

Tests	Treatments					*P*-value
	T_1	T_2	T_3	T_4	T_5	
PCV%	22.9 ± 0.132*d	24.8 ± 0.272c	28.2 ± 0.467b	32.1 ± 0.271a	31.4 ± 0.202a	0.0001
Hb%	7.90 ± 0.171c	8.19 ± 0.084bc	8.45 ± 0.075b	10.50 ± 0.144a	10.38 ± 0.111a	0.0001
RBC (million/ml^3)	6.29 ± 0.145c	8.50 ± 0.217b	8.50 ± 0.269b	11.17 ± 0.348a	10.65 ± 0.404a	0.0001
WBC (thousand/ml^3)	14.29 ± 0.936d	22.58 ± 0.472c	26.19 ± 0.551b	31.36 ± 0.365a	25.92 ± 0.521b	0.0001
Lymphocyte (thousand/ml^3)	5.84 ± 0.129d	20.57 ± 0.696c	26.24 ± 0.599b	30.95 ± 0.592a	27.71 ± 0.629b	0.0001
Platelets (thousand/ml^3)	456 ± 6.78c	510 ± 5.49b	515 ± 1.80b	549 ± 5.09a	552 ± 3.72a	0.0001
Cholesterol (mg/dl)	17.0 ± 0.342a	14.4 ± 0.314b	14.4 ± 0.633b	12.3 ± 0.240c	15.0 ± 0.597b	0.0001
Glucose (mg/dl)	77.3 ± 1.09a	66.9 ± 0.538b	66.6 ± 0.580b	53.4 ± 0.398c	68.0 ± 0.819b	0.0001
Urea (mg/dl)	64.8 ± 1.09a	58.6 ± 0.894b	51.0 ± 0.775c	50.8 ± 0.259c	67.0 ± 0.544a	0.0001
Protein (gm/dl)	5.03 ± 0.053c	5.48 ± 0.058b	5.48 ± 0.086b	6.12 ± 0.123a	6.09 ± 0.086a	0.0001
Albumin (gm/dl)	3.09 ± 0.126	2.99 ± 0.152	2.84 ± 0.205	2.97 ± 0.153	2.91 ± 0.082	N.S.**
Globulin (gm/dl)	1.93 ± 0.159c	2.48 ± 0.163b	2.63 ± 0.157b	3.07 ± 0.071a	3.16 ± 0.136a	0.0001

* Means ± Standard Error.** N.S.: Non-Significant.a, b, c: means in the same Rows with different superscripts differ significantly at probability value (P≤0.05).

(P≤0.05) as compared with other treatment. There was a significant decrease in the glucose and urea concentration (P≤0.05) in T_3 and T_4 as compared with other treatment. T_4 showed the lowest significant (P≤0.05) in the concentration of glucose. There was no significant difference between treated group in the concentration of cholesterol and albumin.

The results also showed at the second period (day 30) (Table 2), that there was a significant increase (P≤0.05) for the T_4 and T_5 as compared other with other treated group in the percentage of PCV, Hb, RBC, blood platelets and the concentrations of the total protein and globulin. T_4 showed significant increases (P≤0.05) in WBC and lymphocytic count while T_4 showed a significant decrease (P≤0.05) in the conc. Of cholesterol and glucose compared with other treated groups. The T_3 and T_4 showed significant decrease (P≤0.05) in the conc. Of urea as compared with other treatments, while there were no differences in the conc. of albumin in all treatments.

The results of the third period (Day 45) (Table 3) showed a significant increase (P≤0.05) in T_4 and T_5 as compared with other treatments in the percentage of HB, RBC, Platelets no. and total protein. The result also showed a significant increase (P≤0.05) in T_4 in PVC as compared with others, while the conc. of globulin showed an increase in the concentration significantly (P≤0.05) in T_5 as compared with T_1, T_2 and T_3, T_4 showed an increase in its value as compared with T_1 and T_3. The conc. of cholesterol and glucose showed significant decrease (P≤0.05) in the T_4 as compared with others. The conc. of albumin showed no difference between the four treated groups.

The results of the fourth period (day 60) showed in Table 4, this period were not differing from that of previous periods it showed no significant increase (P≤0.05) in percentage of PCV, Hb and platelets counts in T_4 and T_5 as compared with other treatments. T_4 showed a significant increase (P≤0.05) in RBC, WBC and lymphocytic cells as compared with others. There was a significant increase (P≤0.05) in total protein at T_4 as compart with the first three treatments. It was also showed T_4 and T_5 a significant increase (P≤0.05) in the conc. of globulin as compared with T_1 and T_2. While, T_4 showed significant decrease (P≤0.05) in the conc. of cholesterol, glucose and urea as compared with other treatment. The conc. of albumin showed no difference in other periods in all treatment.

The significant difference observed in PCV, Hb, blood platelets and RBC values, which produced from addition

of various levels of ginger and vit. E as compared with the control, might be due to the role of ginger to stimulate apatite and improve digestion of food material consumed, that leads to beneficial effect from food elements especially vitamins and proteins that plays a role in the synthesis of RBCs that effects of another parameters of blood (PVC and Hb %) and the blood platelets (Hung, 1991; Al-Saidia, 2010). Ginger contains Fe (Mabey, 1988). which is essential for the synthesis of RBCs or it might be due to the presence of antioxidant in ginger such as gingerol, shagaols and phenyl kiton and also due to the action of vit. E that protect the body cells from free radicals which include secretion cells that enhance the synthesis of RBCs such as ESF, which secreted from the kidney so increase RBC and Hb when a positive correlation presence between them. The antioxidant that mentioned and vit. E protect blood platelets and increase its synthesis and life. The active substances present in ginger and vit. E play a role in protect the organ produced white blood cells such as thymus gland and bone marrow from the toxic effect of free radicals although it protects WBC and prevents the effects of free radicals and increase its life that leads to increase their number (Hadi, 2009). The improvement of immune response as a result of addition of ginger and vit. E might be due to the content of ginger of multi active substances that act synergistically to improve blood cells characteristics. The significant improvement in biochemical blood traits understudy except in conc. of albumin might be due to addition of ginger and vit. E to protect body cells such as liver cells and Beta-cells of pancreas from the side effect or advirse effect of free radicals produced from biological activity of the body and the active substances present in ginger tend to reduce lipid levels (Al-Janabi, 2004; Sabeg, 2010) or it might be due to content of ginger of an active substances such gingerol that prevents inflammation in the body and protect Beta-cells of pancreas that secret insulin leads to decrease in glucose conc. In the blood which stimulates cells receptors to facilitate the passage of glucose into the body cells to produce energy essential for maintenance of biological activity in the body (Sekua *et al*, 2004; Ashokkumar *et al*, 2020). The decrease in cholesterol level might be due to addition of ginger that have a biological active substance inhibits the yeast (HMG COA red), which limits biological maturation of cholesterol (Sabour *et al*, 2012; Noaman, 2018). The significant increase in protein conc. might be due to the role vit. E and ginger on body cells to protect epithelial line of the digestive system that increase absorption of amino acids, which given with the ration and provide a good condition for microbial digestion of food substance consumed that

Table 3 : Effect of ginger in blood tests of ewes at 45 days of experiment

Tests	Treatments					*P*-value
	T_1	T_2	T_3	T_4	T_5	
PCV%	22.1 ± 0.562*e	24.8 ± 0.275d	28.6 ± 0.244c	31.6 ± 0.317a	30.3 ± 0.500b	0.0001
Hb%	7.57 ± 0.165c	8.52 ± 0.066b	8.77 ± 0.040b	10.60 ± 0.151a	10.72 ± 0.131a	0.0001
RBC (million/ml^3)	6.06 ± 0.161c	8.54 ± 0.204b	8.84 ± 0.062b	10.92 ± 0.451a	10.41 ± 0.585a	0.0001
WBC (thousand/ml^3)	15.68 ± 0.413c	23.71 ± 0.936b	26.16 ± 1.16b	31.11 ± 0.439a	25.29 ± 0.899b	0.0001
Lymphocyte (thousand/ml^3)	6.31 ± 0.262d	20.98 ± 0.645c	26.69 ± 0.727b	30.99 ± 0.401a	26.62 ± 0.756b	0.0001
Platelets (thousand/ml^3)	452 ± 5.46c	511 ± 2.22b	516 ± 4.30b	555 ± 4.47a	554 ± 6.96a	0.0001
Cholesterol (mg/dl)	17.5 ± 0.453a	14.3 ± 0.522b	13.9 ± 0.509b	12.0 ± 0.292c	15.2 ± 0.413b	0.0001
Glucose (mg/dl)	79.0 ± 0.962a	64.7 ± 1.03b	66.0 ± 0.986b	53.0 ± 0.630c	66.0 ± 0.493b	0.0001
Urea (mg/dl)	66.5 ± 1.15a	54.6 ± 0.900b	51.5 ± 1.45bc	48.2 ± 2.38c	65.7 ± 1.15a	0.0001
Protein (gm/dl)	4.99 ± 0.055c	5.56 ± 0.143b	5.52 ± 0.106b	6.13 ± 0.136a	6.19 ± 0.085a	0.0001
Albumin (gm/dl)	2.99 ± 0.096	2.97 ± 0.109	2.98 ± 0.125	3.15 ± 0.074	2.86 ± 0.121	N.S.**
Globulin (gm/dl)	2.00 ± 0.120d	2.59 ± 0.181bc	2.54 ± 0.101c	2.98 ± 0.152ab	3.33 ± 0.131a	0.0001

* Means ± Standard Error.** N.S.: Non-Significant.a, b, c: means in the same Rows with different superscripts differ significantly at probability value (P≤0.05).

Table 4 : Effect of ginger in blood tests of ewes at 60 days of experiment.

Tests	Treatments					*P*-value
	T_1	T_2	T_3	T_4	T_5	
PCV%	22.3 ± 0.204*d	24.7 ± 0.664c	28.7 ± 0.366b	31.8 ± 0.321a	31.4 ± 0.192a	0.0001
Hb%	7.40 ± 0.201c	8.42 ± 0.260b	8.90 ± 0.070b	10.92 ± 0.267a	10.68 ± 0.182a	0.0001
RBC (million/ml^3)	6.47 ± 0.158d	9.00 ± 0.100c	9.09 ± 0.152c	11.72 ± 0.406a	9.92 ± 0.370b	0.0001
WBC (thousand/ml^3)	14.33 ± 1.06d	24.19 ± 0.535c	26.51 ± 0.714b	31.27 ± 0.350a	26.75 ± 0.798b	0.0001
Lymphocyte (thousand/ml^3)	6.31 ± 0.279d	22.55 ± 0.279c	26.76 ± 0.207b	30.69 ± 0.244a	26.18 ± 0.657b	0.0001
Platelets (thousand/ml^3)	440 ± 7.07c	511 ± 3.67b	518 ± 1.22b	560 ± 6.69a	555 ± 10.0a	0.0001
Cholesterol (mg/dl)	18.1 ± 0.602a	13.4 ± 0.548b	14.1 ± 0.597b	11.5 ± 0.318c	13.8 ± 0.539b	0.0001
Glucose (mg/dl)	76.7 ± 0.810a	66.0 ± 0.578b	66.9 ± 0.679b	53.6 ± 0.700c	66.5 ± 1.13b	0.0001
Urea (mg/dl)	66.5 ± 1.13a	53.5 ± 0.774b	50.7 ± 1.03b	41.8 ± 0.902c	66.1 ± 1.27a	0.0001
Protein (gm/dl)	4.88 ± 0.125d	5.48 ± 0.086c	5.64 ± 0.146bc	6.08 ± 0.093a	5.93 ± 0.145ab	0.0001
Albumin (gm/dl)	3.24 ± 0.118	3.22 ± 0.073	3.02 ± 0.060	2.97 ± 0.051	3.04 ± 0.061	N.S.**
Globulin (gm/dl)	1.63 ± 0.213c	2.26 ± 0.132b	2.62 ± 0.201ab	3.11 ± 0.081a	2.88 ± 0.163a	0.0001

* Means ± Standard Error.** N.S.: Non-Significant.a, b, c: means in the same Rows with different superscripts differ significantly at probability value (P≤0.05).

leads to positive balance of nitrogen to the ewes (grzanna *et al*, 2005). The significant improvement in globulin level as a result of addition of different levels of ginger and vit. E might be due to the role of active substances in ginger and the role of vit. E to improve immune response which explained by increase in the numbers of WBC resulted from additives that remove the free radicals and protect the main immune organs (Kinalski *et al*, 2000). While no presence of significant difference in conc. of albumin might be due to good management of ewes, with no infections with diseases especially liver disease. The protection of the liver from disease plays an important role in keeping the conc. of albumin constant. The liver considered the main organs synthesized albumin. The positive significant difference in urea conc. In blood serum might be due to addition on ginger that play role in protein synthesis and protect the kidneys for their functions. It was concluded from this study that addition of ginger and vit. E have appositive effects of blood traits in ewes.

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