The effect of supplementing Allicin or Ginger to fattening Awassi lambs rations on some cellular and biochemical blood parameters with rumen fermentation

Jameel S Lazem¹ and Ahmed H AL kelabe²

¹,² Al-Furat Al-awsat Technical University/ Technical College of Mussaib, Iraq

Email: Ahmedalkelabe77777@gmail.com

Abstract. This research was conducted to investigate the effect of Allicin and Ginger supplementation to the rations of Awassi lambs on some cellular and biochemical blood parameters with ruminal fermentation. A total number of 28 Awassi lambs were used in this experiment, those lambs were divided in to 4 equal groups. The ¹st group was used as a control (without any supplement), the ²nd group was supplemented with 3 kg Allicin /ton of feed, the ³rd group was supplemented with Ginger 2 kg/ ton of feed, meanwhile the ⁴th group was supplemented with the append of Allicin 1.5 kg/ ton with 1.0 kg/ton of Ginger. The results illustrate a highly significant difference (p< 0.01) in WBCs, RBCs, BCV and Hb as well as blood glucose, cholesterol, urea, triglycerides and the total protein. Additionally, the rumen pH, ammonia nitrogen as well as Total volatile fatty acids were significantly affected due supplementation of Allicin with Ginger during the mid-experiment (45 days) except the triglycerides with total protein which were recorded surpassing during the end of the experiment (90 days). The rumen fermentation was surpassed in groups of lambs which were supplemented with Allicin with Ginger in comparison with the control group during the second aspiration (after 3 hours of morning feeding), the rumen pH was significantly elevated, meanwhile, the ammonia nitrogen and total volatile fatty acids were reduced with advanced age during morning feeding. It was concluded that supplementing of Allicin or Ginger had been affected some blood parameter as well as rumen fermentation due to the utilization of feed supplements which gave a superior animal performance.

Key words: Allicin , Ginger , Awassi lambs

Introduction :

Recent researches habitude to use small amounts of feed supplements such as medicinal herbs and others in order to ameliorate the feed value of concentrates or roughages in ruminants rations, those supplements must be easily used with low costs.

Awassi sheep stocks reached about 17 million in number during the year 2018 in Iraq according to of statitical table of Agricultire Ministry(2018).

Lazem and AL – Maamory (2017) had been used Allicinin rations of Awassi lambs , the result showed superior responses when Allicin was added at a level of 2 – 4 kg/tan of feed likewise superior results were obtained by addition of ginger roots in the rations of lambs by 1.5 – 3 kg/ton of feed ( Hammody,
2012; Lazem and AL-Dulaymi, 2012). The study parameter showed the animal haigen however the factors affecting the age in viremental and nutritional statues (Murray et al., 2006). The current study aimed to indicate supplement the best levels of Allicin or ginger or their combination to the rations of Awassi fattening lambs on some cellular and biochemical parameter with rumen fermentation.

**Materials and Methods:**

A total number of 28 male Awassi lambs were used in the experiment, those lambs were allotted randomly into 4 equal groups (7 lambs/group) with an initial weight 21.6 ± 0.5 kg at 4 – 5 months of age.

Each group fed by group feeding to 91 days on one of the rations which were, the 1st ration was without any addition (control), the 2nd ration was supplemented with 3 kg/ton of Allicin, the 3rd ration was supplemented with 2 kg/ton ginger, meanwhile the 4th ration was supplemented with a combination of 1.5 kg/ton Allicin plus 1.0 kg/ton of ginger (Table 1).

Roughage of chipped barely hay with drinking water was given adlibitum.

**Table 1:** Row material (%) in components of concentrate ration

| T4     | T3     | T2     | T1     | Materials         | N. |
|--------|--------|--------|--------|-------------------|----|
| 3.5    | 3.5    | 3.5    | 3.5    | Soyaben mail      | 1  |
| 40     | 40     | 40     | 40     | White bran        | 2  |
| 10     | 10     | 10     | 10     | Flour             | 3  |
| 3      | 3      | 3      | 3      | Yellow corn flour | 4  |
| 30     | 30     | 30     | 30     | Combound feed     | 5  |
| 10     | 10     | 10     | 10     | Molasse           | 6  |
| 1.5    | 1.5    | 1.5    | 1.5    | Urea              | 7  |
| 0.1    | 0.1    | 0.1    | 0.1    | Yeast             | 8  |
| 0.5    | 0.5    | 0.5    | 0.5    | Sun flower oil    | 9  |
| 0.7    | 0.7    | 0.7    | 0.7    | Lime stone        | 10 |
| 0.7    | 0.7    | 0.7    | 0.7    | Soft salt         | 11 |
| 100    | 100    | 100    | 100    | Total             | 12 |
| 0.15   | 0      | 0.3    | 0      | Allicin           | 13 |
| 0.1    | 0.2    | 0      | 0      | Ginger            | 14 |

Blood samples were collected by the Jugular vein from 3 lambs in each group in the started with the mid-period (45 days) with the end of the experiment (90 days) prior to the morning feeding (P1, P2 and P3) to estimate some cellular blood parameters such as Red and White blood corpuscles (RBC and WBC), Packed Cell Volume(PCV), Hemoglobin (Hb) as well as biochemical blood parameters such as blood glucose, cholesterol, urea, triglycerides and total protein. Those blood parameters were conducted in the physiology laboratory in the Technical college AL – Mussaiab by using special kits for each item.

Rumen fermentation was estimated along 3 periods (before morning feeding, P1, after morning feeding by 3 hours, P2 and 6 hours after that P3) at the end of the experiment (90 days) to evaluate rumen pH, Ammonia nitrogen with total Volatile fatty acids.

Experimental rations were analyzed in the feeding laboratory, Technical college AL – Mussaiab according to the proximate analysis (Table 2).
Table 2: Chemical composition of all the experimental rations and its contained of the metabolic energy

| Treatment | ME* MJ/kg DM | Ash | NFE   | EE   | CF   | CP   | DM   | Treatment |
|-----------|--------------|-----|-------|------|------|------|------|-----------|
| T1        | 11.40        | 7.31| 60.19 | 1.78 | 6.31 | 17.54| 93.13| T1        |
| T2        | 11.45        | 7.71| 61.97 | 1.49 | 4.63 | 17.34| 93.14| T2        |
| T3        | 11.67        | 6.55| 60.83 | 2.38 | 5.96 | 17.63| 93.35| T3        |
| T4        | 11.58        | 7.48| 60.95 | 2.25 | 4.67 | 17.66| 93.01| T4        |
|           | 11.53        | 7.26| 60.99 | 1.98 | 5.39 | 17.54| 93.16| Average   |

Statistical analysis of the results were conducted to the factorial design (3 × 4) by using SAS (2012), Duncan Multiple Range Test (1955) was used to compare the differences between means.

Results and discussions:

Table 3 referred to a highly significant differences (P< 0.01) of WBCs either by the effect by the treatment or the time with their interaction. Ginger treatment (T3) which attained 11.02 ×10³/µL on other treatments, then the control treatment (T1) which was 9.86 ×10³ subsequently Allicin treatment (T2) which was 9.53 ×10³ the 4th treatment which included the blend of Allicin with ginger was of the lowest value.

There were highly significant differences (P< 0.01) in relation to the time of blood collection, the first collection (P1) surpassed which was equal 11.38 × 10³ on other two blood collections(P2 and P3) which were 11.19 ×10³ and 6.55× 10³ respectively which were differed in between by a highly significant differences.

Interaction revealed that (T3) surpassed during the first collection (P1) which was 14.53 ×10³ on other treatments followed by supplementation treatment for the second collection, then subsequent interaction of treatment with time so that the lowest values of WBCs count were recorded in the lambs fed on combination of Allicin with ginger during the third collection which was equal to 5.10 × 10³.

This may be attributed to the effect of the supplement of Allicin with ginger or its combination of the immune status of the lambs (Chang 1995) or due to the ginger works as inti-inflamina tiou (Ali et al.,2007;shulka and singh ,2006)
Table 3: Effect of supplementing Allicin or Ginger or their mixture to the Awassi fattening lambs ration with the cellulous blood parameter.

| FACTORS | Hb g/dl | PCV % | 106/µL×RBC | 103/µL×WBC | stander error±mean |
|---------|---------|-------|------------|------------|-------------------|
| T1      | c 0.73±11.34 | 2.30±35.88c | 0.23±3.65c | 0.64±9.86b | T1                 |
|         | a 0.26±13.78 | a 0.83±43.66 | ba 0.11±4.46 | c 0.72±9.53 | T2                 |
|         | a 0.69±14.04 | a 2.08±44.22 | a 0.30±4.70 | a 1.07±11.02 | T3                 |
|         | b 0.52±13.15 | b 1.58±41.55 | b 0.14±4.30 | d 0.90±8.42 | T4                 |

** Significant

** Time

** Treatment

** Interaction

** T1 P1

** T2 P2

** T3 P3

** T4 P1

** T4 P2

** T4 P3

** T1 P1

** T1 P2

** T1 P3

** T2 P1

** T2 P2

** T2 P3

** T3 P1

** T3 P2

** T3 P3

** T4 P1

** T4 P2

** T4 P3

Table 3 showed also highly significant differences (P<0.01) in RBCs count either due to the effect of the treatment or the time with their interaction. The ginger treatment (T3) surpassed on other treatments which was 4.70×10⁶/µL, meanwhile, control treatment (T1) recorded the lowest values which were 3.65 × 10⁶.

Time of blood collection caused surpassing of all treatments during the starting period (P1) and mid-period (P2) which were equal 4.41 and 4.45×10⁶ respectively. Total RBCs count during the 90 days of the experiment recorded the lowest values which were 3.96×10⁶. The Interaction between treatments with the time of blood collection revealed that the third treatment (T3) in the second collection which was 5.86 × 10⁶ on other treatments. Results of interaction showed the highest values of supplementation treatments especially for the second collection followed by the first collection time, the lowest values were recorded in all lambs during the third blood collection time, This may be attributed to the lambs which were reached to a special state during the mid-period of the experiment in RBCs count but it was of a highly significant effect for the supplementation of Allicin with ginger.
or combination of them which induced abroad transport of oxygen in blood by means of RBCs to the different body tissues, this may cause areal response in performance of Awassi lambs.

Results of table 3 showed highly significant increase (P< 0.01) of the third treatment in the PCV on other treatments as well as the significant increase was highly significant in the first collection time of blood in lambs in comparison with the mid-period (the second collection time ) and the end of the experiment (the third collection time).

The interaction between treatments with the time of collection an increased value of the second collection time in the third treatment was noticed highly significant on other treatments of supplementation. It was noticed that the values were significantly affected in the supplementation treatments in the first and second collection time. Effect of supplementation or time of blood collection or the interaction between them for hemoglobin a similar effect to that of the PCV.

Blood biochemical parameters (Table 4) showed highly significant differences due to the effect of supplementation with the time of blood collection. Blood glucose surpassed in the second treatment for the first collection time, followed by T4 on other treatment which indicated a direct effect of Allicin in increasing blood glucose in the lambs. We can showed although the lowest (P< 0.01) cholesterol in T3 comparative with another treatments, that may be due to the ginger have been decreased it (Omage et al., 2007)

Blood urea revealed a surpass for all treatments with the time of blood collection in comparison with a control treatment in the first collection time. The effect of supplementation and time of blood collection were similar, the treatment of combination of Allicin with Ginger during the third collection time in T4 was highly significant on other treatments, then the third treatment in the third collection time in comparison with T1 and T2.

Table 4: Effect of supplementing Allicin or Ginger or their mixture to the Awassi fattening lambs ration with the biochemical blood parameter.

| Total protein g/dl | Tryglictrid mg/dl | Urea mg/dl | Cholesterol mg/dl | Glucose mg/dl | Factor | Treatment | Time | Significant | Treatment | Time | Significant | Treatment | Time |
|--------------------|-------------------|------------|-------------------|---------------|--------|-----------|------|-------------|-----------|------|-------------|-----------|------|
| b 1.69 ± 55.66     | b 8.40 ± 46.95    | c 1.02 ± 47.88 | c 3.57± 65.11    | b 0.64± 9.86 | T1     |          |      |             |           |      |             |           |      |
| a 3.98 ± 58.77     | a 8.49 ± 53.37    | b 0.40 ± 49.51 | a 4.18± 81.44    | c 6.19 ± 83.00 | T2     |          |      |             |           |      |             |           |      |
| a 1.95 ± 59.22     | b 8.56± 45.03     | a 0.40 ± 50.77 | b 6.09± 72.11    | d 3.63 ± 78.11 | T3     |          |      |             |           |      |             |           |      |
| a 2.74 ± 60.00     | a 9.48 ± 55.77    | b 0.33 ± 49.77 | c 3.51± 67.66    | a 4.04± 87.22 | T4     |          |      | **          |           |      | **          |           |      |
| **                  | **                | **          | **                | **            |        |          |      |             |           |      |             |           |      |
| c 0.93 ± 49.25     | b 1.33 ± 56.75    | b 0.81 ± 48.33 | c 1.80 ± 60.33   | b 1.63 ± 78.66 | P1     |          |      |             |           |      |             |           |      |
| b 1.09 ± 59.50     | c 2.72 ± 18.30    | a 0.37 ± 50.45 | a 4.34± 82.08    | a 1.76 ± 99.91 | P2     |          |      |             |           |      |             |           |      |
| a 1.19 ± 66.50     | a 2.67 ± 75.80    | a 0.28 ± 49.68 | b 3.21± 72.33    | c 1.00 ± 71.41 | P3     |          |      |             |           |      |             |           |      |
| **                  | **                | **          | **                | **            |        |          |      |             |           |      |             |           |      |
| ef 0.66 ± 51.33    | b 3.00 ± 59.00    | c 0.57 ± 44.00 | g 1.00 ± 55.00   | f 0.66 ± 82.33 | T1 P1  |          |      |             |           |      |             |           |      |
| cd 1.20 ± 53.66    | cd 5.73± 14.53    | ab 0.87± 50.00 | f 1.66± 61.66    | c 0.57 ± 98.00 | T1 P2  |          |      |             |           |      |             |           |      |
| **                  | **                | **          | **                | **            |        |          |      |             |           |      |             |           |      |
Means in the same column for each item with different superscripts different significantly ** (P<0.01).

Table 5 revealed an increase of ruminal acidity (low pH) during aspiration of the ruminal fluid, 3 hours after morning feeding, the highest acidity was noticed in lambs of the third group (T3) and (T4), but it was noticed a reduction of ammonia nitrogen in the lambs included in those treatments. meanwhile, the best results recorded a highly significant effect in lambs of (T4) in all time of ruminal fluid aspiration.

**Table 5**: Effect of supplementing Allicin on Ginger or their mixture to the Awassi fattening lambs ration with the rumenal fermentation.
This may indicated that supplements induced superior responses in comparison with the control as well as it induced an optimum ruminal environment by presence of Allicin in the diet through appearance of acid and total volatile fatty acid values which increased the effect ruminal microbes to utilize the produced ammonia in the rumen efficiently which reflects a better performance of lambs by supplementing of Allicin with Ginger or combination as it is compared with control.

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