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# THE FEEDING EFFECTS OF URONIC ACID EXTRACTION FROM *Sargassum crassifolium* ON UNSATURATED FATTY ACIDS AND THE IMMUNITY OF LOHMAN CHICKEN EGGS

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***Abstract***

*Antibiotics are currently not allowed to be used because they can make pathogenic bacteria resistant and leave residues in products. The purpose of this study was to determine whether Lohman chicken eggs' immunity was affected by drinking water containing uronic acid extracted from Sargassum crassifolium (S. crassifolium). Sixty laying hens were divided into two groups: 1) chickens fed commercial feed with antibiotics, and 2) chickens fed feed without antibiotics. The chickens were randomly assigned to one of five treatments that included brown seaweed in the drinking water, A1 = 0.0% (control); A2 = 2.5%; A3 = 5.0%; A4 = 7.5%; A5 = 10.0%. Five treatments, two factors, and three replications were used in the completely randomized study design. Six laying hen heads were included in each replication. Titer antibody and unsaturated fatty acid were different between treatments, but Salmonella sp. infection was the same. It came to the conclusion that the lohman chicken eggs' immunity and unsaturated fatty acid levels were both enhanced by the uronic acid extracted from S. crassifolium.*

***Key words**: fatty acid, immunity, Lohman chicken, Sargassum crassifolium, uronic acid.*

## INTRODUCTION

*Sargassum crassifolium* (*S. crassifolium*) is a member of the Phaeophyceae (brown algae) family. It has true roots, stems, and leaves (Yenusi et al., 2014), a variety of forms, and a predominant brown or blonde color that does not change with drying (Merdekawati & Susanto, 2009). It has been demonstrated that brown seaweed (*S. crassifolium*), which has major components such as sugar, sulfate, and uronic acid, acts as an antiviral and antibacterial agent (Mandal et al., 2007). Carotenoids and polysaccharides are found in *S. crassifolium*. Polysaccharides aid in digestion, reduce blood lipid and cholesterol levels, and possess anti-thrombotic, anticancer, antioxidant, antiproliferative, anti-inflammatory, anticoagulant, and antiproliferative properties (Zhao et al., 2005). Polysaccharides, dietary fiber, minerals, proteins, amino acids, vitamins, polyphenols, and carotenoids (Burtin, 2007) are among the antioxidants found in seaweed, according to numerous studies.

Because it hasn't been used to its full potential, seaweed can be processed into ingredients for animal feed. According to March et al. (2013) and Anggadiredja et al. (1996), seaweed is a natural source of non-starch polysaccharides that contains a lot of crude fibers. Its bioactive factors affect the digestive process, changing the microflora in the caecum and allowing laying hens to use nutrients effectively.

If you want to eat eggs, you should look at their quality. The search for various forms of unsaturated fatty acids, which the body needs to prevent a variety of diseases, began. Customers tend to prefer eggs of higher quality. Also, very important for getting good egg parts is feeding, especially feed with a lot of nutrients in it (Kereh et al., 2019). However, livestock can be harmed by microbes found in food, water, or the air, such as viruses or bacteria. Bacteria, such as *Salmonella* species group, frequently transmit contamination of chickens to consumers through the hatching, growth, and post-harvest stages (Gantois, 2009). These bacteria will have an impact not only on the health of livestock but also on the safety of meat or egg products that humans will consume. This has been overcome through vaccination, sanitation, and antibiotic use, among other methods.

This effort is useful, but it has some limitations, like some bacteria strains that are resistant to antibiotics (Devegowda et al., 1997).

Antibiotics are used to stop pathogens from growing (Farhad & Farida, 2011; Teteh et al., 2016). However, the use of antibiotics in feed has been restricted due to their tendency to increase pathogen bacteria's resistance (Abdulhasan, 2018; Santoso et al., 2018). As a result, antibiotic alternatives made from natural ingredients are required in feed formulas (Abaza, 2007; Winsisch et al., 2008; Abbas, 2013; Aqil, 2016; Mahfuz et al., 2017; Voemesse et al., 2018) in order to produce meat and egg products that are safe, healthy, and competitive (Mattjik & Sumertajaya, 2002; Rusli et al., 2015).

Utilizing *S. crassifolium* containing uronic acid may become an alternative to antibiotics. *S. crassifolium* has not yet been reported as a potential seaweed additive for feed ingredients, particularly feed additives. Therefore, the purpose of this study was to investigate how Lohman chicken eggs' immunity was affected by uronic acid extracted from *S. crassifolium* as a substitute for antibiotics.

## MATERIALS AND METHODS

### Research Material

This study used 120 Lohman strains aged 22 weeks and brown seaweed (*S. crassifolium*). Antibiotic-containing feed and antibiotic-free feed were the commercial feeds used in the study. Brown seaweed (*S. crassifolium*) extract was added to drinking water at concentrations of 0, 2.5, 5.0, 7.5, and 10%.

Table 1 displays the feed's nutritional content. A 35 x 36 x 42 cm individual battery cage with a feeding area, drinking water, and lights (16L/8D lighting system) was used.

Before beginning treatment, the chickens were introduced to the provisional feed and water for a week. For three months, the chicken needed to be looked after.

### Preparation of Seaweed extract

100 grams of dried seaweed were mixed with ethanol (90 percent) (5:1), stirred for three hours, left to stand for 24 hours at room temperature, and then concentrated at 50 degrees Celsius to produce seaweed extract.

Table 1. Nutrient content of feed

| | Nutrient composition |
|---|---|
| Dry mater (%) | 93.02 |
| Ash (%) | 10.77 |
| Crude protein (%) | 18.12 |
| Ether extract (%) | 5.63 |
| Crude fibre (%) | 6.16 |
| BETN (%) | 52.34 |
| Gross energy (kcal/kg) | 37.34 |
| Calcium (%) | 5.85 |
| Phosphor (%) | 0.71 |

### Feeding Trial

Twenty-two 18-week-old Lohman strains were divided into two groups: 1) chickens fed antibiotic-laden commercial feed and 2) chickens fed antibiotic-free feed One of the five treatments containing brown seaweed was randomly assigned to the chickens: 0, 2.5, 5.0, 7.5, or 10%) in the water used for drinking. In the morning (at 7 a.m.) and afternoon (at 17 p.m.), ad libitum feed and water were given to the animals.

### Variables observed

The variables observed in this study included the following: egg unsaturated fatty acid, the immunity of laying hens to Salmonella sp. Detected by coagglutination test and antibody titer detected by serological tests

### Trial Design and Data Analysis

An experiment with a completely random design and three replications was carried out in a 5x2 factorial arrangement. Six laying hens lived in each replication. The first factor was the amount of brown seaweed (*S. crassifolium*) present in the water used for drinking (A1 = 0% *S. crassifolium* in the control); 2.5% *S. crassifolium* in A2; A3 contains 5% *S. crassifolium*; 7.5% *S. crassifolium* in A4; A5 is *S. crassifolium* 10.0%. The presence or absence of antibiotics in the feed was the second factor (B1 indicates feed with additional antibiotics, B2 indicates feed without additional antibiotics). The data were analyzed using analysis of variance followed by Duncan's multiple range test and the orthogonal polynomial test using the SPSS® 21.0 statistical software program.

## RESULTS AND DISCUSSIONS

Coagglutination and serological tests revealed that Lohmann chickens' immunity was affected by the administration of uronic acid extracted from *S. crassifolium* in drinking water as an alternative to antibiotics. The chicken's resistance to Salmonella sp. detected by a test of coagglutination. All of the research chickens treated with the uronic acid level of *S. crassifolium* with or without antibiotics in their feed had positive reactions to Salmonella sp., according to the analysis of chicken blood coagglutination. All chickens treated with *S. crassifolium* uronic acid levels exhibited immunity against *Salmonella* sp., as demonstrated by these results.

Serological tests revealed the contained antibody titer of the poultry blood serum. According to the findings of the statistical analysis performed on the antibody titer of Lohman chickens, the treatment of feed without antibiotics with a level of 10% *S. crassifolium* (B2A5) yielded the highest antibody titer in comparison to other treatments at the end of the study (34th week), whereas the treatment of uronic acid levels had non-significant differences (P>0.05) at the beginning of the study (3rd week) (Table 2).

Table 2. Effect of uronic acid level on chicken antibody titer

| Factor | 3th week | | | 34th week | | |
|---|---|---|---|---|---|---|
| | B1 | B2 | Average | B1 | B2 | Average |
| A1 | 2.33 | 0.33 | 1.33 | 2.33[a] | 2.33[a] | 2.33 |
| A2 | 2.67 | 2.00 | 2.33 | 3.67[b] | 2.33[a] | 3.00 |
| A3 | 3.00 | 1.67 | 2.33 | 2.67[a] | 3.00[a] | 2.84 |
| A4 | 2.67 | 2.67 | 2.67 | 3.33[a] | 3.00[a] | 3.17 |
| A5 | 3.00 | 3.33 | 3.17 | 3.00[a] | 4.67[b] | 3.84 |
| Average | 2.73 | 2.00 | | 3.00 | 3.07 | |

A1 = 0% Uronic acid (control), A2 = 2.5% Uronic acid, A3 = 5% Uronic acid, A4 = 7.5% Uronic acid, A5 = 10% Uronic acid, B1 = Feed with antibiotic; B2 = Feed without antibiotic. A different superscript in the same row shows a significant difference (P<0.05).

The effect of the treatment of brown seaweed extract (*Sargassum crassifolium*) in the drinking water of laying hens on egg palmitic acid levels can be seen in Table 3. *Sargassum crassifolium* 10% were significant (P<0.01) have higher unsaturated fatty acid than level of *Sargassum crassifolium* 0% and 2.5%, but have non significantly (P>0.05) than level of *Sargassum crassifolium* 7.5%.

With a level of uronic acid extracted from *S. crassifolium* present in drinking water, feed intake (g/head/d) tended to be higher without antibiotics than with antibiotics. This shows that *S. crassifolium* - derived uronic acid can increase feed intake and facilitate feed digestion in drinking water.

Table 3. Effect of uronic acid level on egg fatty acid

| Factor | palmitic | | oleic | | linoleic | |
|---|---|---|---|---|---|---|
| | B1 | B2 | B1 | B2 | B1 | B2 |
| A1 | 19.20 | 19.28 | 33.41 | 33.35 | 7.67 | 7.40 |
| A2 | 20.37 | 20.78 | 36.68 | 36.18 | 10.27 | 10.81 |
| A3 | 20.66 | 22.18 | 37.80 | 39.71 | 10.28 | 11.14 |
| A4 | 23.27 | 22.68 | 38.07 | 38.69 | 10.50 | 9.62 |
| A5 | 21.52 | 22.04 | 38.98 | 38.38 | 10.03 | 10.43 |
| Average | 21.00 | 21.39 | 36.99 | 37.26 | 9.75 | 9.88 |

A1 = 0% Uronic acid (control), A2 = 2.5% Uronic acid, A3 = 5% Uronic acid, A4 = 7.5% Uronic acid, A5 = 10% Uronic acid, B1 = Feed with antibiotic; B2 = Feed without antibiotic. A different superscript in the same row shows a significant difference (P<0.05).

Zhao et al. (2005) mentioned that *S. crassifolium* might make it easier to digest food. According to the findings of this study, the alginate that is derived from the uronic acid that is extracted from *S. crassifolium* probably played a significant role in increasing the feed intake of Lohman chickens. According to Brownlee et al. (2005), alginate is a soluble fiber that reduces blood glucose levels, reduces intestinal lumen toxicity, eliminates harmful microbial colonies, absorbs toxins in the colon, and alters intestinal microflora. Because of these conditions, more feed is taken in and the rate at which the digestive tract is emptying faster.

Eggs have a low percentage of unsaturated fatty acids due to the transfer of those fatty acids. The linoleic content of egg yolks will rise when fed a source of polyunsaturated fatty acids (PUFA), whereas the oleic content will decrease. The same effect can be seen when uronic acid extracted from *S. crassifolium* is added to drinking water.

*Salmonella* sp. immunity is present in all chickens treated with *S. crassifolium* uronic acid levels. This is possible due to the immune-modulatory properties of brown seaweed polysaccharides. Both specifically and non-specifically, the immune system's defenses are strengthened by immunomodulators, which also induce non-specific cellular and humoral defense mechanisms. These non-starch polysaccharides arrive in the intestines intact and serve as immunostimulants (Ale et al., 2011) because they are resistant to saliva's digestion and hydrolysis in the mouth, stomach, and small intestine.

At the conclusion of this study, the antibody titer value generally increased when the uronic acid level of *S. crassifolium* in laying hens was higher (Table 1). This demonstrates that layer hens' antibody can be increased with the uronic acid from *S. crassifolium*. Antibodies may be produced by the *S. crassifolium* uronic acid, which may prevent viral replication. According to Han & Marasco (2011), the body's defense against viruses relies heavily on antibody-mediated immune responses. By binding to viral proteins, antibodies prevent viral replication, thereby preventing the replication process.

## CONCLUSIONS

Unsaturated fatty acid levels and immunity in Lohman chicken eggs have been raised by administering uronic acid extracted from *S. crassifolium* in water as an alternative to antibiotics.

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