The Digestive Tract of Lohman Chicken:
Effects of Given Drinking Uronic Acid Extraction from *Sargassum crassifolium*

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ABSTRACT
The use of antibiotic in poultry is not allowed due to its potential of bacterial resistance and its potential of residue in the poultry products. Brown seaweed (*Sargassum crassifolium*) contains sugar, sulphate, and uronic vitriol which display antibacterial and antiviral activities. This research aims to examine the effect of adding uronic sulfuric acid extracted from *Sargassum crassifolium* (*Sc*) on the weight of digestive organs (as % of BW) of Lohman hens. The stomach is a body part of poultry that consisted of yield, gizzard, ventriculus, duodenum, jejunum, ileum, caecum, and colon as rates of BW. One hundred and twenty laying hens were grouped into two main groups: (1) groups of laying hens given commercial antibiotic and (2) group of laying hens without antibiotic. The hens were divided into five treatments of brown seaweed (Sc) extract in drinking water: A1=0% Sc (control); A2=2.5% Sc; A3=5% Sc; A4=7.5% Sc; and A5=10% Sc. The research used Completely Randomized Design by Factorials Pattern consisted of 5 brown seaweed extract treatments as first factor and presence of antibiotic in feed as second factor; each treatment was replicated 3 times. Every replication comprised of six birds. The variables observed in this research were weight of viscera (as % of BW) of digestive organs. There were significant difference between hens given antibiotic and without antibiotic in feed on the crop, gizzard, proventriculus, jejunum, ileum, caecum, and colon weight; however there were no difference on the duodenum weight. It can be inferred that uronic sulfuric acid extracted from *Sc* has potency to increase the viscera weight (as % of BW) of laying Lohman hens. The treatment 10.0% *Sc* in drinking water without antibiotic in feed has the most elevated digestive organs weight.

Keywords: *Sargassum crassifolium, uronic acid, Lohman chicken, digestive tract.*

1. INTRODUCTION

Sargassum crassifolium (*Sc*) is an species of Phaeophyceae class (Brown algae class), which has prerogative roots for cheer for staunches and leaves [1], shifted structures, and to a great extent chocolate brown or blonde tinge (these tones don't change even with drying) [2]. Brown seaweed has in its considerable parts including sugar, sulfate, and uronic sulfuric acid and has been displayed to antiviral and antibacterial activities [3]. Seaweed contains polysaccharides [2], polyphenols, and carotenoids [4]. Polysaccharides delight oneself an impression in decrease parentage lipid, and cholesterol levels, they work within assimilation, and they chalk up antithrombotic, antitumor, antioxidant [5], antiproliferative, anti-inflammatory [6], and anticoagulants properties [7]. Specifically, a few syntheses the accessibility of endless cancer prevention agents in ocean growth, much as polysaccharides, dietetical fiber, minerals, proteins, alkane acids, nutrients, polyphenols, and carotenoids [8].

Seaweed accessibility is very plentiful and has not been ideally used along these lines, it tends to be prepared into creature feed fixings. As expressed by Anggadiredja *et al.* [9] and March *et al.* [10] seaweed is characterized by containing non-starch polysaccharides that contains numerous unrefined filaments and its bioactive components that influence the stomach related interaction bringing about changes in microflora

condition in the caecum and can be utilized as supplements to increase the production of laying hens [9], [10].

Assimilation, or hack slash preparing, is a fundamental section of animal like feeding [11]. In reply to the protest of processing, a few animals like genealogy chalk up developed heterogeneous morphological and physiological transformations during their developmental history. This is especially valid for birds, which have numerous specific gastrointestinal organs. Permitting the nutrient of *Sc* with uronic sulfuric acid substance devoured by chicken impacts the stomach related cycle in the gastrointestinal system.

The use of seaweed (*Sc*) as a potential kelp added substance in feed fixings, particularly feed added substances is as yet not announced. Along these lines, this thinks about planned to look at the impacts of uronic sulfuric acid separated from seaweed as an anti-microbial substitute on the unfilled weight (% Body Weight) for each fragment of the intestinal system of Lohman chickenhearted groceries.

2. MATERIALS AND METHODS

2.1. Research Material

This research utilized 120 mature Lohman strains hens aged 22 weeks and brown seaweed (*Sc*). The commercial feed utilized in this research were feed containing antibiotic and without antibiotic. Supplementation of brown seaweed extract were 0%, 2.5%, 5.0%, 7.5%, and 10.0% given in drinking water. The nutrients content of the feed is introduced in Table 1.

The cages utilized were individual battery cages (size 35cm x 36cm x 42 cm), equipped with lights (16L/8D lighting framework) for heat source, and drinking water. The hens were adjusted to the temporary drinking water for multiple weeks and feed for a couple of months before treatment started. The hens were kept done for 90 days.

Table 1. Nutrient content of the feed

Nutrient	Composition
DM (%)	93.02
Ash (%)	10.77
CP (%)	18.12
EE (%)	5.63
CF (%)	6.16
BETN (%)	52.34
GE (kcal/kg)	37.34
Ca (%)	5.85
P (%)	0.71

DM: dry matter, CP: crude protein, EE: extract ether, CF: crude fiber, GE: gross energy, Ca: calcium, P: phosphor.

2.2. Preparation of Seaweed Extract

Extract of brown seaweed was made by blending 0.1 Kg of dry brown seaweed with 90% ethanol (1:5 ratios), mixed and stirred for 180 minutes and kept at room temperature for 24 hours. The mixture was then dried at oven at the temperature of 50°C.

2.3. Feeding Trial

One hundred and twenty Lohman strain hens aged 4.5 months were divided into two groups: (1) hens given commercial antibiotic in feed; and (2) hens given no antibiotic in feed. The hens were held in individual battery cage and treated with five levels of brown seaweed in drinking water: 0%, 2.5%, 5%, 7.5%, and 10%. Water and feed are given twice a day in the morning (7.00 AM) and evening (5.00 PM).

2.4. Variables Observed

The variables observed in this research are weight of viscera of Lohman hens which consisted of crop, gizzard, ventriculus, duodenum, jejunum, ileum, caecum, and colon (as % of BW).

2.5. Research Design and Data Analysis

The research was conducted by Completely Randomized Design by Factorials Pattern. The first factor is different levels of brown seaweed (*Sc*) given in drinking water: A1 (0%; control group), A2 (2.5% *Sc*), A3 (5% *Sc*), A4 (7.5% *Sc*), and A5 (10% *Sc*). The second factor is different antibiotic treatment: antibiotic-given group (B1) and non-antibiotic-given group (B2). Each treatment was replicated 3 times; and each replication comprised of 6 laying hens.

The data obtained was analysed using Analysis of Variance followed by Honestly Significant Difference test utilizing the Minitab® 16 program.

Table 2. Effect of uronic acid level on digestive organ weight (% of BW) of longman chicken.

Treatment	Digestive Organ (% of BW)							
	Crop	Gizzard	Ventriculus	Duodenum	Jejunum	Ileum	Caecum	Colon
A1B1	0.243^{b}	1.270^{ab}	0.417^{b}	0.443	0.723	0.720^{b}	0.290^{d}	0.177^{c}
A1B2	0.287^{ab}	1.473^{a}	0.470^{ab}	0.397	0.863	0.687^{b}	0.390^{cd}	0.287^{abc}
A2B1	0.330^{ab}	1.210^{ab}	0.403^{b}	0.397	0.763	0.763^{b}	0.433^{bc}	0.467^{ab}
A2B2	0.327^{ab}	1.363^{ab}	0.440^{ab}	0.407	0.690	0.697^{b}	0.513^{ab}	0.403^{abc}
A3B1	0.303^{ab}	1.370^{ab}	0.417^{b}	0.460	0.830	0.680^{b}	0.393^{cd}	0.470^{ab}
A3B2	0.280^{b}	1.177^{b}	0.437^{ab}	0.380	0.853	0.710^{b}	0.483^{abc}	0.370^{abc}
A4B1	0.303^{ab}	1.410^{ab}	0.457^{ab}	0.370	0.967	0.793^{b}	0.450^{bc}	0.270^{bc}
A4B2	0.387^{a}	1.473^{a}	0.490^{ab}	0.480	0.910	0.810^{ab}	0.433b^{c}	0.503^{ab}
A5B1	0.240^{b}	1.170^{b}	0.420^{b}	0.450	0.940	0.710^{b}	0.563^{a}	0.317^{abc}
A5B2	0.423^{a}	1.490^{a}	0.547^{a}	0.473	0.987	1.077^{a}	0.590^{a}	0.517^{a}
P Value	0.002	0.014	0.025	0.473	0.133	0.006	<0.001	0.005
MSE	0.029	0.078	0.024	0.032	0.061	0.056	0.022	0.048

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

3. RESULTS AND DISCUSSION

3.1. Results

The results of this research shows positive responses of the treatments of uronic acid extracted from *Sc* either in antibiotic feed or non-antibiotic feed affects positively the chicken intestinal system on digestive organs weight. The analysed data of treatments' effects on Lohman hens (Table 2) shows that the levels of uronic acid treatment interact with antibiotic addition in feed on crop, gizzard, poventriculus, jejunum, ileum, caecum, and colon; however there is no difference in duodenum and jejunum. The treatment 10.0% *Sc* without antibiotic in feed shows the most elevated weight of viscera (% BW) for the crop (0.423%), gizzard (1.490%), ventriculus (0.547%), ileum (1.077%), and colon (0.517%).

3.2 Discussion

For the most part, feed admission (g/head/d) without antibiotic agents with a degree of uronic sulfuric acid extracted from *Sc* in drinking water would in general be higher than feed consumption with antibiotic agents. These discovering shows that uronic sulfuric acid extracted from *Sc* in drinking water can increase feed admission and cause a smooth assimilation measure for feed. Zhao *et al.* [5] stated that *Sc* can work with food absorption. This research results shows that alginate from the uronic acid extracted from *Sc* likely played a broad pantomime in expanding the feed admission of Lohman hens. Brownlee *et al.* [12] expressed that alginate is a dissolvable fiber that is advantageous in lessening blood glucose levels, decreasing harmfulness levels of gastrointestinal lumen, diminishing microbial states that are not helpful, engrossing poisons in the colon, and changing digestive microflora. These conditions cause the feed assimilation rate, and the pace of the intestinal system exhausting to be quicker and cause expanded feed consumption.

The ventriculus is the instrument for mechanical digestion in birds. The gizzard, also named capably constructed stomach, is consisted of kaolin (keratenoid) layer and an implied mucosa. A few birds applied fortitude in the ventriculus to exaggerate mechanical digestion effectiveness. In the gizzard, healthy densification and translational emphasis naturally measure ingesta. Comprehensive hack slash ideas are specifically immune system in the ventriculus until these are undercoat to an inconsequential proportion [13]. Dietary designs fundamentally influence gizzard strength in birds, including homegrown chickens [14].

The utilization of uronic sulfuric acid extracted from *Sc* in drinking water will in general show a similar impact. All chickens treated with different levels of uronic acid extracted from *Sc* shows insusceptibility against *Salmonella sp*. This is conceivable because the polysaccharides comprise of brown seaweed have immunomodulatory activities. The Immunomodulators stimulate the activity of the body's immune system both innate and specific immune systems; and in specific immune system both the cell-mediated and humoral immune system. These polysaccharides are non-starch polysaccharides that are impervious to digestion and hydrolysis by saliva in the mouth, stomach, and small digestive system, so they show up in the digestive organs unobstructed and perform as immunostimulators [15].

The uronic sulfuric acid levels of *Sc* in laying hens would in general expand the antibody agent titer esteem toward the finish of this examination. That shows the uronic sulfuric acid from *Sc* can be utilized to expand the immune system of laying hens. The uronic sulfuric

acid from *Sc* has the possibility to debilitate viral resonation by framing antibodies. Han and Marasco [16] express that immune system stimulating specific responses are extremely expansive for the body's immune system against viral contaminations. Immune system hinders viral replication by restricting viral proteins, consequently repressing the replication work.

4. CONCLUSION

The addition of uronic sulfuric acid extracted from *Sargassum crassifolium* in drinking water as a substitute for antibiotics has the potency to increase the weight of digestive organs of laying Lohman hens.

REFERENCES

[1] Yenusi, T.N.B., A. Sabdono dan I. Widowati, 2014. Studi komposisi dan potensi antioksidan dari pigmen rumput laut *Turbinaria conoides* yang berasal dari perairan pantai Hamadi Jayapura Papua. Seminar Nasional Kimia dan Pendidikan Kimia VI : ”Pemantapan Riset Kimia dan Asesmen dalam pembelajaran Berbasis pendekatan Saintifik” Surakarta, 21 Juni 2014. P.316-325.

[2] Merdekawati W dan A.B. Susanto, 2009. Kandungan dan komposisi pigmen rumput laut serta potensinya untuk kesehatan. Squalen., 4(2): 41-47.

[3] Mandal, P., C.G. Mateu, K. Chattopadhyay, C.A. Pujol, E.B. Damonte and B. Ray, 2007. Structural features and antiviral activity of sulphated fucans from the brown seaweed *Cystoseira indica*. Antiviral Chemistry & Chemotherapy., 18: 153-162.

[4] Wijesinghe W.A.J.P and Y.J. Jeon, 2011. Enzyme-assistant extraction (EAE) of bioactive components: A useful approach for recovery of industrially important metabolites from seaweeds: A review. Fitoterapia., 83(1): 6-12.

[5] Zhao, X., C.H. Xue, Y.P. Cai, D.F. Wang and Y. Fang, 2005. The study of antioxidant activities of fucoidan from *Laminaria japonica*. High Technology Letters., 11: 91-94

[6] Shiratori, K., K. Ohgami, I. Ilieva, X.H. Jin, Y. Koyama, K. Miyashita, K. Yoshida, S. Kase and S. Ohno, 2005. Effect of fucoxanthin on lipopolysaccharide-induced inflammation in vitro and in vivo. Exp. Eye Res., 81: 442-428.

[7] Chandia N.P and B. Matsuhiro, 2008. Characterization of a fucoidan from *Lessonia vadosa* (Phaeophyta) and its anticoagulant and elicitor properties. International Journal of Biological Macromolecules., 42: 235-240.

[8] Burtin, P, 2003. Nutritional value of seaweeds. Electron. J. Environ. Agric. Food Chem., 2: 498–503

[9] Anggadiredja, Hasanudin, Sidiq A.S, Pratomo S, Rudyansyah A, 1996. Screening of marine algae from Warambadi Seachore Sumba Island of Indonesia for antibacterial activity. Photomedicine., 1996(3): 1-37

[10] March, W., N. Hamid, T. Liu, J. Lu and W.L. White, 2013. Fucoidan from New Zealand Undaria Pinnatifida: monthly variations and determination of antioxidant activities. Carbohydrt Polym., 95: 606-614.

[11] Gantois, I., R. Ducatelle, F. Pasmans, F. Haesebrouck, R. Gast, T.J. Humphrey and F.V. Immerseel, 2009. Mechanisms of egg contamination by *Salmonella ebteritidis*. Federatiom of European Microbiological Societies.Belgium : Blackwell publishing.

[12] Brownlee, I.A., A. Allen, J.P. Pearson, P.w. dettmar, M.E. Havler and M.R. Atherton. 2005. Alginate as a source of dietary fiber. Critical review i Food Science and Nutrition., 45:497-510.

[13] Hetland H, Svihus B, Krogdahl A. 2003. Effects of oat hulls and wood shavings on digestion in broilers and layers fed diets based on whole or ground wheat. British Poultry Science 44(2):275–282 DOI 10.1080/0007166031000124595.

[14] Sacranie A, Svihus B, Denstadli V, Moen B, Iji PA, Choct M. 2012. The effect of insoluble fiber and intermittent feeding on gizzard development, gut motility, and performance of broiler chickens. Poultry Science 91(3):693–700 DOI 10.3382/ps.2011-01790.

[15] Farhad, A. and R.A. Farida, 2011. Factor affecting quality and quantiy of egg production in laying hens; A review. World Appl. Sci. J., 12: 372-384.

[16] Teteh, A., M. Gbeassor, E. Decuypere and K. Tona, 2016. Efects of Moringa oleifera leaf on laying rate, egg quality and blood parameters. Int. J. Poult. Sci., 15(7): 277-282.