The utilization of extract and powder of Batak onion (Allium chinense) as an antibiotic to broiler chicken performance

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Abstract. Broiler chickens are susceptible to diseases come from bacteria. The bacteria that usually infect broiler chickens is Escherichia coli which can cause diarrhea. The precaution is done using antibiotics, usually. This study aimed to analyse the effect of Batak Onion (Allium chinense) extract and powder as an antibiotic to the performance of broiler chicken. Research method was using the completely randomized design (CRD) with 7 treatments and 3 repetitions, and five samples of broiler chicken were used for each repetition. The treatments were P0A: Control without infection, P0B: with E. coli infection, P1: P0A + Batak Onion Extract (A. Chinense) (1%), P2: P0A + Batak Onion Powder (A. Chinense) (0.05%), P3: P0B + Batak Onion Extract (A. Chinense) (1%), P4: P0B + Batak Onion Powder (A. Chinense) (0.05%) and P5: P0B + Tetracycline Antibiotic (0.05%). Result of the research showed result that were not significantly different for feed consumption, weight gain and feed conversion before infection which was in contrast with after infection condition. It can be concluded that the use of Batak onion extract and powder can be used as a natural antibiotic to replace the tetracyclines.

1. Introduction
Broiler chicken is included in the main meat producing livestock due to its fast growth with a short maintenance period. Nevertheless, the broiler chickens are susceptible to diseases which come from bacteria. Bacteria that usually infects the broiler chickens is Escherichia coli which can cause diarrhea.

Precaution is usually done by implementing antibiotics. These antibiotics can result residues in livestock products and can cause resistant microbes to develop in both livestock and human who consume these products. Therefore, currently we need natural antibiotics to help the immune system of poultry, especially the broiler chickens. One of the antibiotics that can be utilized is the extract and powder derived from Batak Onion.

Batak Onion (Allium chinense) contains of 81.4% water and 12.3% carbohydrates. Other compounds consist of fiber, protein and fat [1]. Batak onions also contain quite high calcium, namely magnesium, phosphorus, carotene, and vitamin C [2]. Allium chinense is rich in biological compounds such as sulfur, steroids, saponins, nitrogen, flavonoids, amino acids and others [3]. The results of Naibaho's research [4] showed that the batak onion extract had antimicrobial activity against the Escherichia coli, Staphylococcus aureus, Salmonella typhi and Bacillus subtilis bacteria, as well as the fungus Candida abicans. The potential of batak onions to be used as a natural antibiotic to inhibit and kill microbes that are not good for the productivity of broiler chickens such as Escherichia coli is the
basis for conducting this research to determine the use of the extract and powder of Batak onion (*Allium chinense*) as an antibiotic in broiler chickens.

2. Materials and methods
This research was done in August - September 2020, at the Limau Manis street, Sinembah Village, Tanjung Morawa District, Deli Serdang Regency.

2.1. Tools and materials
This research was using several tools such as buckets, 100 ml measuring cups, lumping porsein (mortar), sieves, analytical scales, pasteure pipet, oven, plastic bags, spluit, glass objects, glass covers, label paper, markers, tissue, thermometer to find out the temperature of the cage, plastic tarpaulin, experimental cage with a size of 50 cm × 100 cm × 100 cm as many as 21 cages, about 21 units of chicken’s feeding and drinking container and 21 units of incandescent lamps (25 watts) for lighting and heating and sprayer as a disinfectant sprayer.

The materials used were 105 one-day-old broiler chickens (DOC), KMnO4, rodalon, vitachick, ND vaccine, Gumboro vaccine, batak onion, commercial feed, tetracycline antibiotics, 70% ethanol, aquades, *Escherichia coli* bacteria isolate obtained from Medan Veterinary and Animal Health Centre.

2.2. Research methods
This research was done experimentally using a Completely Randomized Design (CRD) with 7 treatments and 3 repetitions and there were five samples broiler chicken for each repetition. As for the treatment given as follows:
- P0A: Control (not infected)
- P0B: Infected by E Coli
- P1: P0A + 1% of Batak Onion Extract
- P2: P0A + 0.05% of Batak Onion Powder
- P3: P0B + 1% of Batak Onion Extract
- P4: P0B + 0.05 % of Batak Onion Powder
- P5: P0B + 0.05% of Tetracycline Antibiotic

2.3. Research parameters

2.3.1. Feed consumption (grams/head/week). The consumption of feed was calculated every week based on the difference between the amount of feed given and the remaining feed and the feed wasted.

2.3.2. Weight gain (grams/head/week). The weight gain was calculated every week based on the difference between the final and the initial body weight.

2.3.3. Feed conversion. The feed conversion was calculated by comparing the amount of feed consumed with the body weight gain achieved each week.

3. Results and discussion

3.1. Feed consumption
Feed consumption is the capability to spend the amount of nutrients in the feed that is given to meet the needs of life. Results of the study about the average feed consumption is shown in Table 1.

In Table 1, the average of feed consumed by the non-infected broiler chicken showed no significant difference, whereas after infected and treated using the tetracycline and Batak Onion showed significant differences and a better average numbers. The highest rate average was found in P1 of 855.42 g and followed by P3, P2, P0A, P5, P4 and the lowest was P0B of 728.48. This is in accordance with the research result of Anggorodi [5], which stated that factors that influencing feed
consumption are livestock health, palatability, feed quality and management, also the *E. coli* infection in broiler chickens that could lowered it. This is in accordance with the statement of Lee [6] which stated that the *E. coli* infection in boiler chickens reduces feed consumption.

**Table 1. Feed consumption (grams/head/week)**

|                | P0A       | P0B       | P1       | P2       | P3       | P4       | P5       |
|----------------|-----------|-----------|----------|----------|----------|----------|----------|
| Not-Infected   |           |           |          |          |          |          |          |
| Week 1         | 179.23ab  | 182.43ab  | 182.03ab | 179.09ab | 181.20ab | 191.85a  | 176.16b  |
| Week 2         | 413.42a   | 400.32a   | 437.64a  | 417.34a  | 424.78a  | 430.60a  | 416.51a  |
| Average        | 296.32a   | 291.36a   | 309.83a  | 298.21a  | 302.98a  | 311.22a  | 296.33a  |
| After Infected |           |           |          |          |          |          |          |
| Week 3         | 677.16b   | 648.54b   | 742.75a  | 683.06ab | 698.51ab | 683.67ab | 693.45ab |
| Week 4         | 914.90b   | 830.06c   | 953.26a  | 921.76ab | 959.99a  | 881.43bc | 909.46ab |
| Week 5         | 793.47b   | 706.62c   | 870.25a  | 813.86ab | 833.74ab | 773.78b  | 784.34b  |
| Average        | 795.75bc  | 728.48d   | 855.42a  | 806.22bc | 830.74ab | 779.62c  | 795.17bc |

Note: Different superscripts on the same column show significantly different effects (P<0.05)

Batak onions contain anti-bacterial compounds that can inhibit and kill bacteria such as *E. coli* and compounds that can be useful for the growth of chickens, so that chickens that were not infected with the treatment were given Batak onion extract. The treatments that were infected and given Batak onion extract have a good similar feed consumption activity with the infected and given tetracycline compared with the infected chickens without any treatments. This is in accordance with the statement of Zhang et al [3] which stated that Batak onion is rich in biological compounds such as sulphur, steroidal, saponins, nitrogen, flavonoids, amino acids and others, and added to the statement by Lin et al [1] which stated that saponin compounds have antibacterial effects, antifungal, antipyretic, increase DNA and protein synthesis, and increase immunity, while the steroid compounds in Batak onions can prevent the cardiac injury caused by oxidative substances which have anti-inflammatory effects because the tubers contain succinic acid.

### 3.2. Weight gain

Weight gain was one of the criteria used to measure growth. Weight gain was calculated by weighing the body weight every week minus the body weight of the previous week. The results of the study that have been carried out obtained the average weight gain of broiler chickens during the study as shown in Table 2.

**Table 2. Weight gain (grams)**

|                | POA       | POB       | P1       | P2       | P3       | P4       | P5       |
|----------------|-----------|-----------|----------|----------|----------|----------|----------|
| Not Infected   |           |           |          |          |          |          |          |
| Week 1         | 171.77ab  | 177.81ab  | 173.95ab | 169.82b  | 174.76ab | 185.29a  | 170.35ab |
| Week 2         | 320.62a   | 339.16a   | 336.37a  | 343.83a  | 346.76a  | 343.42a  | 342.89a  |
| Average        | 246.19a   | 258.48a   | 255.16a  | 256.37a  | 260.75a  | 264.35c  | 256.61c  |
| After Infected |           |           |          |          |          |          |          |
| Week 3         | 502.70b   | 413.27d   | 587.63a  | 528.97b  | 454.86b  | 421.87d  | 478.21bc |
| Week 4         | 563.73ab  | 430.87c   | 594.33a  | 566.00ab | 551.87ab | 502.31b  | 558.33ab |
| Week 5         | 486.18a   | 365.20b   | 500.98a  | 489.97a  | 470.67b  | 465.49ab | 461.33ab |
| Average        | 517.54bc  | 403.11d   | 560.98a  | 528.31ab | 492.46bc | 463.22c  | 499.29bc |

Note: Different superscripts on the same column show significantly different effects (P<0.05)
The body weight of not infected broiler chickens average value showed a not significant difference in the treatment of POA, POB, P1, P2, P3, P4, P5, as shown in Table 2, this was because the feed consumption of each treatment was the same, then the rate of weight gain was just as good and the feed consumption is included as the factors that affect the growth rate of body weight. This condition is in accordance with the statement of Kartadisastra [7], which stated that the chicken body weight will be determined by the amount of feed consumption, the greater the body weight of chicken the more the amount of feed consumed.

Moreover, the average value of body weight growth after being infected by *E. coli* has a significant effect as shown in Table 2. Where the highest was in P1 of 560.98 g and the lowest was in P0B of 403.11 g, which mean that *E. coli* bacteria infection in chickens could influence the body weight growth of broiler chickens.

In Table 2, after the chickens were infected, it can be seen that the chickens that was treated with the tetracycline, batak onion extract and powders showed a higher body weight gain compared to the infected chickens without being treated with tetracycline, batak onion extract and powder. This was because batak onions have antibacterial compounds, namely saponins, steroids, and flavonoids. This is in accordance with Retnowati et al. [8] which stated that flavonoid compounds can damage cell membranes and kill the microbial enzyme system thereby inhibiting bacterial growth.

### 3.3. Feed conversion

Feed conversion is the ratio between the feed consumption and the body weight growth obtained within a certain period of time. Feed conversion is useful for measuring livestock productivity. The high of feed conversion indicates that more feed is needed to increase body weight per unit weight and the lower the feed conversion rate means the better feed quality. Results of the average value of broiler chicken feed conversion during the study can be seen in Table 3.

| Table 3. Average value of broiler chicken feed conversion |
|----------------------------------------------------------|
|              | POA  | POB  | P1   | P2   | P3   | P4   | P5   |
| Not- Infected |      |      |      |      |      |      |      |
| Week 1       | 1.03a| 1.02a| 1.05a| 1.06a| 1.03a| 1.03a| 1.03a|
| Week 2       | 1.28ab| 1.27b| 1.29a| 1.22ab| 1.22ab| 1.25b| 1.21ab|
| Average      | 1.15a| 1.09b| 1.17a| 1.14ab| 1.13ab| 1.14ab| 1.12ab|
| After Infected|      |      |      |      |      |      |      |
| Week 3       | 1.35b| 1.57a| 1.26b| 1.29b| 1.53a| 1.62a| 1.45ab|
| Week 4       | 1.62b| 1.93a| 1.60b| 1.62b| 1.74ab| 1.76ab| 1.63b|
| Week 5       | 1.63a| 1.95a| 1.73a| 1.68a| 1.77a| 1.69a| 1.72a|
| Average      | 1.53c| 1.82a| 1.53c| 1.53c| 1.68bc| 1.69ab| 1.60bc|

Note: Different superscripts on the same column show significantly different effects (P<0.05)

Table 3 showed that the value of the feed conversion average of not-infected broiler chickens showed no significant difference and the average conversion value was excellent (under 2). This was because the POA, POB, P1, P2, P3, P4, and P5 treatments were equally good in digesting nutrients from feed so that the feed conversion was not much different. This is in accordance with Rasyaf [9] which stated that the smaller the feed conversion means the feeding is more efficient, in contrast if the feed conversion enlarged, there will be a waste of feed.

From Table 3, the average value of the feed conversion of broiler chickens after infection showed a significant difference, with the highest average value in P0B of 1.82 and followed by P4, P3, P5, POA, P2, P1. There were several factors that influence the feed conversion, such as animal health and cage temperature. This condition is in accordance with Lacy and Vest [10] which stated that factors affecting feed conversion including genetic, feed quality, disease, temperature, cage sanitation,
ventilation, medication, and cage management. Moreover, the lighting factor and feeding also played a crucial role in influencing the feed conversion, physical form, travel rate in the digestive tract, and the nutritional composition of feed.

Result on the variable of feed consumption, weight gain and feed conversion showed that giving of Batak onion (*Allium chinense*) was able to compensate the usage of commercial antibiotics in the form of tetracyclines, so it is aimed that the usage of antibacterial properties from Batak onions can replace the usage of AGP (Antibiotic Growth Promoter), such as tetracyclines which can cause residue and resistance. This is in accordance with the statement of Murdiati and Bahri [11] which stated that tetracycline class antibiotics in feed circulating in the market have been reported, as well as the presence of tetracycline residues in broiler chicken meat that is ready to be marketed.

### 4. Conclusions

The usage of Batak onion (*Allium chinense*) is effective in improving the performance (feed consumption, weight gain, and feed conversion) of broiler chickens which were both infected and not infected by the *Escherichia coli* bacteria. Moreover, it can be used as a natural antibiotic to replace the tetracycline.

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