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Effect of Adding Synbiotic Isolate *Pediococcus Pentosaceus* Strain N6 and Cassava Peel Flour on the Digestibility of Dry Matter and Organic Matter of Super Native Chickens

[1]Sukani, [1]N.br Ketaren,[2]S.Mutia R.M

[1]Animal Science Study Program, Faculty of Agriculture, Universitas Sumatera Utara, Padang Bulan Medan, 20155, Indonesia

[2]Medan Veterinary Centre, Indonesia

Abstract. Public awareness of healthy food is currently getting stronger. Food should be free from antibiotics. As consequence the use of antibiotics as feed additives should be prohibited because it has the potential to produce residues in livestock products and indirectly impact consumers. An alternative substitute for antibiotics that has been widely developed is the administration of synbiotics. Synbiotics are a combination of probiotics and prebiotics. The purpose of this study is to investigate *Pediococcus pentosaceus* strain N6 isolate as a probiotic and cassava peel as a prebiotic. The research design used was a non-factorial Completely Randomized Design (CRD) with 4 treatments and 5 replications. Each replication consisted of 5 chickens with treatments; P0: Basal ration without additive feed (control), P1: Basal ration + additive feed 150 ml/kg ration, P2: Basal ration + additive feed 300 ml/kg ration and P3: Basal ration + additive feed 450 ml/kg ration. The best digestibility of dry matter and organic matter of super native chicken was obtained in treatment the addition of feed additives of 450 ml/kg ration. In conclusion feed additives of 450 ml/kg ration give good effect on digestibility as well as on feed consumption, dry matter consumption and organic matter consumption.

Keywords: antibiotic, cassava peel flour, digestibility, pediococcus pentosaceus strain N6 isolate

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1. Introduction

Nowadays, the need for animal protein, especially from chicken, is increasing, along with the increasing public awareness about the importance of consuming animal protein. According to [1], in 2022 the production of super native chicken is 276,728.20 tons. This shows that the poultry sector plays an important role in fulfilling people's needs for animal protein.

One type of native chicken that has high potential to be developed as a meat-producing chicken is the super native chicken. Super chickens are a cross between male native chickens and laying breeds. Recently, super native chickens are in great demand by the public because in addition to their fast growth and disease resistance. Another advantage that super native chickens have is that they are able to adapt well to the

*Corresponding author at: **Faculty of Agriculture, University of North Sumatra, Medan, North Sumatra**
E-mail address: achmadsadeli@usu.ac.id

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surrounding environmental conditions [2].

Public awareness of healthy food is food that is free from antibiotics, the use of antibiotics as a feed additive has been banned because it has the potential to produce residues in livestock products and indirectly affects consumers. An alternative to antibiotics that is widely developed is the provision of synbiotics. Synbiotics are a combination of probiotics and prebiotics. One of the synbiotics that can be used is *Pediococcus pentosaceus* Strain N6 isolate as a probiotic and cassava peel as a prebiotic.

The high production of cassava in Indonesia causes an abundance of cassava peel waste, which is around 2-3 million tons / year based on [3]. One of the efforts to reduce this waste is by utilizing cassava peels as a feed additive because the oligosaccharides contained therein can be utilized as a medium for microbial growth or commonly referred to as prebiotics. In addition to the use of cassava peel, necessary to add lactic acid bacteria as probiotics or good microbes that will develop in the digestive tract.

Synbiotics have synergistic effects that can improve the health status of the digestive tract, digestibility of feed ingredients, antibacterial activity, immunity to infection and broiler performance [4]. In addition, the addition of synbiotics can improve the digestibility of nutrients consumed by livestock.

The digestibility of organic matter of a feed shows the quality of the feed that is digested by the body, because most of the dry matter components consist of organic matter so that the factors that affect the low organic matter. The high and low consumption of organic matter depends on the high and low consumption of dry matter. High dry matter digestibility in livestock indicates high nutrient digestion. The normal range of dry matter digestibility is between 50-60% [5]. Included in dry matter are structural carbohydrates, non-structural carbohydrates, protein, fat, and ash.

One factor that affects digestibility is the amount of feed consumed. Chickens consume rations approximately equivalent to 5% of body weight. Palatability is influenced by the shape, odor, taste, texture, and temperature of the food provided. According to [6, 7] ration consumption is the amount of ration given minus the amount of ration remaining. The nutrient content contained in cassava peel is: 79.6% extract material without nitrogen (BETN), 6.78% crude protein (PK), 2.27% crude fat (LK), 11.35% crude fiber (SK), and 9.46% ash [8]. Based on research [9] that the provision of a combination of cassava peel with lactic acid bacteria (duck cecum isolate) as a feed additive has a significant effect ($P < 0.05$) on feed consumption, the provision of synbiotics as much as 200 ml / kg of ration resulted in the highest average ration consumption of 2514.86 g / head.

Based on the description above, it is necessary to conduct research on the addition of synbiotic isolate *Pediococcus pentosaceus* strain N6 and cassava peel flour on the digestibility of dry matter and organic matter of super native chickens.

2. Materials and Methods

2.1. Place and Time

This research was conducted at Jalan Balai Desa Dusun 2 Sumberingin Gang Anggrek no 40 Namo Bintang Pancur Batu Village from September to December 2022.

2.2. Materials and Equipment

The materials used were *day old chick* (DOC) of 100 super native chickens, cassava peel as prebiotic and *Pedioccus Pentosaceus* Strain N6 isolate as probiotic in feed ingredients.

2.3. Research Methods

The test used 100 super native chickens aged 1 day DOC. The study was conducted for 10 weeks, using a completely randomized design (CRD) with 4 treatments and 5 replications, each plot was filled with 5 c h i c k e n s . The treatments consisted of:

P0 = Basal ration without feed additives (Control)
P1 = Basal ration + feed additive 150 ml/kg ration
P2 = Basal ration + feed additive 300 ml/kg **r**ation
P3 = Basal ration + feed additive 450 ml/kg ration
Treatment feed is given every day, feed and water are given adlibitum.

2.4. Research Parameters

Ration Consumption
Dry Material Consumption
Dry Material Consumption
Digestibility of Organic Matter

2.5. Data Analysis

The data collected is then processed statistically by analysis of variance (F test), and if a significant difference is found, it is continued with the Duncan test.

3. Results and Discussion

3.1. Ration Consumption

Ration consumption is the amount of ration consumed by livestock every day. Ration consumption can be calculated based on the amount of ration given minus the amount of ration remaining divided by 7 days. Super native chicken ration consumption can be seen in “Table 1”.

Table 1. Average consumption value of super native chicken ration (g/head/week)

Treatment	Repeat					Mean ± SD
	U1	U2	U3	U4	U5	
P0	385,00	383,50	391,00	389,50	392,00	^{A}388.20 ± 3.75167
P1	392,40	395,50	395,00	392,50	397,50	^{B}394.58 ± 2.15801
P2	397,00	399,50	401,50	401,50	409,00	^{C}401.70 ± 4.48051
P3	420,60	426,30	430,10	425,80	430,50	^{D}426.66 ± 4.00537

Description: Different superscripts in the same row and column indicate significantly different (P<0.01).

“Table 1” shows that the ration consumption of super native chickens ranged from 383.50 - 430.50 g/head/week. The highest treatment mean value in this study was P3 which amounted to 426.66 g/head/week and the lowest treatment mean value was in the P0 treatment which amounted to 388.20 g/head/week. Based on “Table 1” that the higher the level of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour, the more ration consumption increases. This is supported by [10] which states that the addition of synbiotics to the ration can make the atmosphere in the digestive tract acidic which will increase the performance and population of digestive enzymes such as protease, lipase and inhibit bacterial growth.

The increase in feed consumption of super native chickens is due to the fact that the treated feed has a wetter texture than the control feed, the higher the level of synbiotics given, the wetter the texture of the feed, resulting in higher feed consumption than the control feed. According to [11], palatability determines the amount of feed consumption, palatability is influenced by the color, shape and texture of the feed. The treatment feed containing lactic acid bacteria *sp*. will be easily digested by the intestines than the control feed, so the livestock are easily hungry and consumption increases.

Based on the analysis of variance (ANOVA), it was found that the addition of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour had a very significant effect ($P < 0.01$) on the consumption of super native chicken rations. This proves that the addition of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour helps the absorption of nutrients in the intestine faster, thereby increasing ration consumption. Research conducted by [9] showed that giving a combination of cassava peel with lactic acid bacteria (duck cecum isolate) as a feed additive had a significant effect ($P <0.05$) on feed consumption, giving synbiotics as much as 200 ml / kg of ration resulted in the highest average ration consumption of 2514.86 g / head. This is also in accordance with research [12] that the addition of garlic (*Alium sativum*) synbiotics with *Lactobacillus acidophilus* bacteria in broiler chickens with the highest synbiotic level treatment (4 ml/kg) resulted in the highest ration consumption of 2.909 kg/head and the lowest ration consumption in the treatment without synbiotics of 2.682 kg/head.

Based on the results of the Duncan's Further Test in “Table 1”, it shows that the P3, P2, and P1 treatments are significantly different and higher than P0. The higher the level of synbiotic isolate *Pediococcus pentosaceus* N6 and cassava peel given, the higher the ration consumption. The increase in ration consumption is due to the bacteria *Pediococcus pentosaceus* N6 and cassava peel in the ration which is a group of LAB (Lactic Acid Bacteria) which can increase enzymatic activity and help digestion, thus causing faster absorption of food substances and the digestive tract empties faster so that super native chickens get hungry faster. With many beneficial microorganisms in the cecum, the absorption of food substances contained in the ration is more efficient and will reduce the nutrients wasted due to the population of harmful microorganisms.

Synbiotic *Pediococcus pentosaceus* N6 and cassava peel in the ration helps to increase the microflora in the gut and suppress the growth of pathogenic bacteria. The application of probiotics and prebiotics in chickens is applied with the aim of, among others, replacing antibiotics. Based on the statement [13] that the way antibiotics work in increasing chicken productivity is by killing pathogenic bacteria in the intestine so that beneficial bacteria in the intestine can develop properly. In contrast, probiotics and prebiotics work by increasing the number of bacteria in the gut, but only beneficial bacteria. The beneficial bacteria can change the atmosphere of the intestinal tract, especially the hydrogen potential (pH), to become acidic, thus increasing gastrointestinal immunity. Probiotics work by producing bacteriocins and short-chain organic acids (lactic, acetic, propionic).

There are several factors that can affect the high and low consumption of rations, among others: 1) ration factors, including digestibility and palatability and 2) livestock factors including age, nation, health conditions and sex of livestock. Palatability will affect the level of ration consumption. High and low feed consumption can be influenced by internal (livestock itself) and external (environment) factors [14].

According to [15], organic acid substances such as lactate, acetate, propionate can inhibit the growth process of harmful microbes so that beneficial microbes can compete for a place in the intestinal epithelium. A decrease in pathogenic bacteria which in turn has an impact on improving the process of nutrient absorption for livestock, in addition to improving performance, ration consumption and meat quality.

3.2. Dry Material Consumption

Dry matter consumption is the amount of feed consumed by livestock in the form of dry matter. Dry matter consumption is obtained from the reduction of feed given with the remaining feed per day multiplied by the dry matter value of the feed. Dry matter consumption of the results of the study can be seen in Table 2.

Table 2. Average values of dry matter consumption of super native chickens (g/head/week)

Treatment	Repeat					Mean ± SD
	U1	U2	U3	U4	U5	
P0	354,74	353,36	360,27	358,89	361,19	^{A}357.69 ± 3.45680
P1	357,32	360,14	359,69	357,41	361,96	^{AB}359.30 ± 1.96378
P2	359,17	361,43	363,24	363,24	370,02	^{B}363.42 ± 4.05115
P3	376,65	381,75	385,15	381,30	385,51	^{C}382.07 ± 3.58440

Description: Different superscripts in the same row and column indicate significantly different (P<0.01)

"Table 2" shows that dry matter consumption of super native chickens ranged from 353.36 - 385.15 g/head/week. The highest mean value was found in P3 treatment which amounted to 382.07 g/head/week and the lowest mean value was found in P0 treatment which amounted to 357.69 g/head/week. Dry matter consumption is correlated with ration consumption, in this study ration consumption ranged from 383.50 - 430.50 g/head/week, with the highest average found in P3 and the lowest in P0 so that it is obtained that the high consumption of dry matter is directly proportional to the high consumption of rations, so that the higher the ration consumption, the higher the dry matter consumption.

Based on the analysis of variance (ANOVA) shows that the addition of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour gives a very significant effect (P <0.01) on dry matter consumption of super native chickens. With the presence of synbiotics, the absorption of dry matter in the intestines of super native chickens will be more, the more cellulase enzymes produced will determine the process of breaking dry matter faster so that the absorption of dry matter is faster. According to [16], the measurement of feed consumption in livestock is usually based on dry matter. Dry matter consumption in livestock is influenced by several things, namely feed factors that follow palatability and digestibility, livestock factors which include nation, gender, age and health conditions.

The results of Duncan's further test analysis in “Table 2” show that the P3, P2, and P1 treatments are higher than P0. However, P0 treatment was not significantly different from P1 but significantly different from P2 and P3. The highest dry matter consumption was found in the P3 treatment which amounted to 382.07 g/head/week with the addition of 450 ml /kg ration of synbiotics. This is because there is a faster absorption of dry matter so that dry matter consumption has increased, which is due to the intestinal surface that has expanded due to the performance of *Pediococcus pentosaceus* and cassava peel synbiotics. Synbiotic products have a synergistic effect on the proliferation and survival of probiotic bacteria in the host's digestive tract. Giving synbiotics can improve intestinal performance and nutrient digestibility by increasing the number of beneficial intestinal microflora, producing short-chain acids in the duodenum, jejenum and increasing the number of intestinal villi to maximize the process of nutrient absorption.

According to [17], the ration consumption of intensively reared native chickens is around 88 grams/head/day. This has an impact on dry matter consumption and excreta produced will tend to be less. This is in accordance with [18] that the decrease in excreta dry matter is in line with the decrease in dry matter consumption. When livestock consume less ration, the opportunity to excrete less as well.

3.3. Organic matter consumption

Organic matter consumption is the amount of feed consumed by livestock in organic form. Organic matter consumption is directly proportional to the dry matter. Organic matter consumption is obtained from dry matter consumption multiplied by the organic matter value of the feed. Organic matter consumption can be seen in “Table 3”.

Table 3. Average organic matter consumption values of super native chickens (g/head/week)

Treatment	Repeat					Mean ± SD
	U1	U2	U3	U4	U5	
P0	329,98	328,69	335,12	333,84	335,98	^{A}332.72 ± 3.21677
P1	331,56	334,18	333,75	331,64	335,87	^{A}333.40 ± 1.82449
P2	328,10	330,16	331,82	331,82	338,02	^{A}331.98 ± 3.70471
P3	339,92	344,53	347,60	344,13	347,93	^{B}344.82 ± 3.23924

Description: Different superscripts in the same row and column indicate significantly different (P<0.01)

Based on “Table 3” shows that the average organic matter consumption of super native chickens ranged from 332.72 - 344.82 g/head/day. The highest average value was found in the P3 treatment which amounted to 344.82 g/head/day and the lowest average value was found in the P0 treatment which amounted to 332.72 g/head/day.

Based on the analysis of variance (ANOVA) showed that the addition of synbiotic isolate *pediococcus pentosaceus* strain N6 and skin flour had a very significant effect (P <0.01) on organic matter consumption of super native chickens. Dry matter consumption in this study ranged from 353.36 - 385.15 g/head/week and organic matter consumption was influenced by palatability and consumption of feed rations by super native chickens, because organic matter consumption is closely related to dry matter consumption because organic matter is the largest part of dry matter. This also applies to the digestibility value if the digestibility of dry matter increases, the digestibility of organic matter also increases. dry matter consumption has a positive correlation with organic matter consumption, because organic matter is part of dry matter, so that dry matter consumption which has a very significant effect results in organic matter consumption also has a very significant effect.

The results of Duncan's further test analysis in Table 3 show that P1 and P3 treatments are higher than P0. However, the P0 treatment was not significantly different from P1 and P2 but significantly different from P3. The higher the level of synbiotics given, the more significant the effect on organic matter consumption. The highest organic matter consumption was found in the P3 treatment which amounted to 344.82 g/head/day with the addition of basal ration + feed additive 450 ml /kg ration. The increase in ration consumption is due to the bacteria *Pediococcus pentosaceus* N6 and cassava peel in the ration which is a group of LAB (Lactic Acid Bacteria) which can increase enzymatic activity and help digestion, thus causing faster absorption of food substances and the digestive tract empties faster so that super native chickens get hungry faster. According to [16], organic matter consumption is influenced by palatability and consumption of feed rations by super native chickens, because organic matter consumption is closely related to dry matter consumption because organic matter is the largest part of dry matter. This also applies to the digestibility value if the digestibility of dry matter increases, the digestibility of organic matter also increases. According to [19], organic matter is part of dry matter, so if dry matter increases organic matter also increases and vice versa. This is because most of the dry matter components consist of organic matter components, the difference between the two lies in the ash content. According to [20] states that organic matter is part of dry matter, so that if dry matter increases it will increase organic matter and vice versa.

3.4. Dry matter digestibility

Dry matter digestibility is obtained from dry matter consumption less dry matter expenditure (feces) divided by dry matter consumption multiplied by 100% dry matter digestibility of this study can be seen in “Table 4”.

Table 4. Average value of dry matter digestibility of super native chicken (%)

Treatment	Repeat					Mean ± SD
	U1	U2	U3	U4	U5	
P0	70,31	70,25	55,91	70,72	66,63	66,76 ± 6,29368
P1	70,31	62,89	72,49	72,70	70,02	69,68 ± 3,98852
P2	87,98	66,77	64,01	61,58	69,00	69,87 ± 10,5048
P3	75,87	77,86	86,10	78,04	69,97	77,57 ± 7,66890

Note: tn (not significantly different)

“Table 4” shows that the average dry matter digestibility of super native chickens ranged from 55.91 - 87.98%. The highest average value was found in the P3 treatment which amounted to

77.57% and the lowest average value was found in the P0 treatment which amounted to 66.76%. Different levels of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour produce different digestibility coefficient values.

Based on the analysis of variance (ANOVA), it was found that the addition of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour did not have a significant effect (P>0.05) on the dry matter digestibility of super native chickens. Many factors affect the digestibility of dry matter in super native chickens such as feed processing, environment, nutrient content and others. According to [21] that factors that affect digestibility in terms of feed digestibility is influenced by the treatment of feed (processing, storage and administration), the type, amount and composition of feed given to livestock.

The highest dry matter digestibility was found in P3 treatment which amounted to 77.57% with the addition of basal ration + feed additive 450 ml /kg ration. The factors that affect digestibility are the composition of feed ingredients, the ratio of the composition of one feed ingredient to another, feed treatment, enzyme supplementation in feed, livestock and feeding rates. Dry matter digestibility is related to the level of dry matter consumption in each treatment. The high digestibility of dry matter is influenced by several factors including the amount and type of feed consumed, the ability of livestock to digest feed ingredients, livestock and environmental conditions [22].

According to [8], the factors that affect the low digestibility of dry matter are the rate of passage of food that is hampered due to health, age and microbes that are unable to digest crude fiber, protein and optimal in the rumen and intestines in the digestive tract. Digestibility that has a high value reflects the amount of contribution of certain nutrients to livestock, while feed that has low digestibility indicates that the feed is less able to supply nutrients for basic life and for livestock production purposes [23]. In this study, the treatment of adding synbiotic isolate (*Pediococcus pentosaceus*) produced the highest digestibility value of 77.57% and the lowest digestibility value of 69.68%, this proves that synbiotics work to help the absorption of dry matter so as to increase the digestibility value of dry matter.

Digestibility is influenced by several factors, namely: feeding rate, animal species, temperature, rate of passage of food through the digestive apparatus, physical form of feed ingredients, feed composition, crude fiber content of feed ingredients, food substance deficiency, processing of feed ingredients, combined effect of feed ingredients, and digestive tract disorders although not consistently.

3.5. Digestibility of Organic Matter

The digestibility of organic matter in the digestive tract of livestock includes the digestibility of feed substances in the form of organic matter components such as carbohydrates, proteins, fats and vitamins. The difference between the amount of organic matter consumed and the amount excreted divided by the amount of organic matter consumed is the digestibility of organic matter. The digestibility of organic matter in this study can be seen in “Table 5”.

Table 5. Average value of organic matter digestibility of super native chicken (%)

Treatment	Repeat					Mean ± SD
	U1	U2	U3	U4	U5	
P0	6,00	7,03	6,94	17,16	8,57	^{a}9.14 ± 4.57704
P1	14,48	11,12	14,36	13,36	13,84	^{b}13.43 ± 1.36716
P2	21,54	21,70	23,66	20,39	24,86	^{c}22.43 ± 1.79613
P3	29,58	29,91	31,55	30,93	33,02	^{d}31.00 ± 1.37770

Notes: Different superscripts in the same row and column indicate significantly different (P<0.01)

Based on "Table 5" the average digestibility of organic matter of super native chickens ranged from 9.14 - 31.00%. The highest average value was found in the P3 treatment which amounted to 31.00% and the lowest average value was found in the P0 treatment which amounted to 9.14%. This is because giving different levels of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour produces different digestibility coefficient values.

Based on the analysis of variance (ANOVA), it was found that the addition of synbiotic isolate *pediococcus pentosaceus* strain N6 and cassava peel flour had a very significant effect (P < 0.01) on the digestibility of organic matter of super native chickens. Probiotics produce enzymes that can increase the absorption of nutrients in the digestive tract of chickens and detoxify toxic substances so that they have the potential to increase the digestibility value of organic matter and dry matter [24]. The results of Duncan's further test analysis in "Table 5" show that the P0 treatment is significantly different (P <0.05) from P1 but very significantly different from P2 and P3. P1 was significantly different (P<0.05) to P2 and significantly different (P<0.01) to P3. P2 is significantly different (P<0.05) from P3.

The higher the treatment given using synbiotic isolate *Pediococcus pentosaceus, the more* significant the effect on the digestibility of organic matter. The highest digestibility of organic matter was found in P3 treatment, which was 31.00% with the addition of basal ration + feed additive 450 ml /kg ration. The increase in ration consumption is due to the bacteria *Pediococcus pentosaceus* N6 and cassava peel in the ration which is a group of LAB (Lactic Acid Bacteria) which can increase enzymatic activity and help digestion, thus causing faster absorption of food substances and the digestive tract empties faster so that super native chickens get hungry faster, therefore the higher the dose given, the higher the liking value of super native chickens which results in an increase in the digestibility of organic matter in super native chickens. Probiotic microbial activity is able to help improve the health of the digestive tract, especially the small intestine from pathogenic microbial disorders, and plays a role in helping to break down complex compounds into simple compounds and easily hydrolyzed by digestive enzymes so that the digestion and absorption process will take place well. According to [25] organic matter is part of dry matter, if there is an increase in the digestibility of dry matter, it will automatically affect the digestibility of organic matter and vice versa, this is because the content of nutritional ingredients of dry matter and organic matter is the same except ash.

Consumption of organic matter is the largest part and dry matter while the amount of dry matter consumption is largely determined by the level of feed consumption of native chickens. Food ingredients that contain high crude fiber will reduce the digestibility coefficient of other food substances. The factor that affects the digestibility of organic matter is the content of nutrients in the ration. The high digestibility of organic matter in this study is directly proportional to the high digestibility of dry matter.

4. Conclusion

4.1. Conclusion

The best digestibility of dry matter and organic matter of super native chickens was obtained in super native chickens given basal rations and the addition of feed additives 450 ml / kg ration, the treatment also gave an influence on ration consumption, dry matter consumption and organic matter consumption.

4.2. Suggestion

Based on this study, it is recommended for further researchers to add the dose of synbiotic isolate *Pediococcus pentosaceus* strain N6 and cassava peel flour to the ration of super native chickens above 450 ml / kg.

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