

Supplementation Mannan-Rich Fraction (MRF) and / or Combination with Probiotic-Enhanced Water Acidifier on Dietary Female Broiler at 28 days as Natural Growth Promoters (NGPs)

D. N. Adli*, Y. Chi, J. W. Lee, O. Sjöfjan*

¹Department of Animal Science, University of Brawijaya, Malang, Indonesia, 65145

Abstract— The limitation of using antimicrobial began in 1997 when the European Union (EU) banned using avoparcin for growth promoters to the livestock. The chase continued, until the last phase when the EU-wide ban on AGPs in animal feed (poultry) took effect since 2006. The research purpose to carried out the possible effect of mannan-rich fraction (MRF) and/ or combination with probiotic enhanced water as natural growth promoters (NGPs) on performance, blood biochemistry. A total of 160 broilers (females) 1-d-old Arbor Acres broiler were divided among 4 dietary treatments with 4 replicate cages per treatments and 10 males broiler per cage assigning experimental units to treatments randomly. The chicken will sacrificed at (28days) (6 each chicken will sacrificed) with amount total 24 broiler sacrificed each periods. The first experiment method was used completely randomized design with 4 treatments and 4 replicates. The treatments used for research were dietary with T0 (control), T1 (basal feed + MRF (Actigen™) 800g/ 400g / 200 g), T2 (Drinking water + 2 ml / L Combination feed additive (Acid-Pak 4-way®)), T3 (basal feed + MRF (Actigen™) 800g/ 400g / 200 g+ Drinking water 2 ml / L Combination feed additive (Acid-Pak 4-way®)). The parameters observed were performance and blood biochemistry. The data would be statistically analyzed using the analyses of variance using one-way anova with Completely Randomized Design (CRD) in Minitab® 16th edition. The differences between the means of groups were separated by Duncan Multiple Range Test ($P < 0.05$). It concluded the addition of mannan-rich fraction and combination with probiotic enhanced liquid acidifier has not significantly different ($P > 0.05$) on growth performance, and blood biochemistry.

Keywords— Broiler, mannan-rich fraction, natural growth promoters, probiotic.

I. INTRODUCTION

Numerous efforts have been undertaken to develop suitable alternatives to counteract the anticipated drawbacks associated with the ban of AGPs. According to the newest regulation, PERMENTAN/14/16/2017 Indonesia has banned the use of antibiotics on poultry. Two main reasons are underlying this regulation: First, residues from antibiotics that will be toxic to consumers. Second, antibiotics can create resistant microorganisms in the body of humans or livestock (especially pathogenic bacteria).

Although it already suggested that antibiotics compounds used as growth promoters in a relatively small amount, it can improve the feed efficiency to help, farmers obtain more enormous profits. Jet *et al.* [1] stated the using feed additive is

one method to improve the quality of feed. The antibiotics are provided as a growth promoter, but antibiotics cause bacterial resistance and residue in the carcass. One of these alternatives were a mannan-rich fraction (MRF) and probiotic enhanced water acidifier, has been the cynosure of abundant studies during the five years. Its beneficial effect on feed efficiency. MRF belongs to the family of prebiotics using new techniques nutrigenomics. Both prebiotic and probiotic use as the substitute from antibiotics because it is safer and act as a natural growth promoter (NGPs) in the broiler.

The research on the several countries used the prebiotics and probiotics with the combination for poultry can give beneficial effect to performance and health. The use of prebiotics and/ or combination with probiotics, acidifier even electrolytes in Indonesia has so far been reported to be able to maintain health, prevent digestive tract disorder by utilizing the microbes for balancing and increasing the population of non-pathogenic bacteria. The addition of combination between probiotics, prebiotics, and acidifier is expected to detoxify toxins and/or their metabolites to improve absorption of nutrients and reduce cholesterol level in blood. One of the diseases caused by cholesterol is atherosclerosis and coronary heart. It occurs due to the total amount of the harmful substances in the walls of blood vessels. Therefore, the objective of this experiment was carried out to determine the possible effect of mannan-rich fraction (MRF) and/ or combination with probiotic enhanced water as natural growth promoters (NGPs) on performance, and blood biochemistry.

II. MATERIALS AND METHODS

A. Location of Study

This study was carried out at the poultry research station, Department of Animal Science, National Pingtung University of Science and Technology (NPUST), Pingtung, Taiwan.

B. Animals and Study Design

A total of 160 broilers (males) 1-d-old Arbor Acres broiler were divided among 4 dietary treatments with 4 replicate cages per treatments and 10 females broiler per cage assigning experimental units to treatments randomly. The chicken will sacrificed at starter periods (21days) (6 each chicken will sacrificed) with amount total 24 broiler sacrificed each periods. The treatments used for research were dietary with T0

(control), T1 (basal feed + MRF (Actigen™) 0.8g/ 100 kg basal diet), T2 (Drinking water + 2 ml / L Combination feed additive (Acid-Pak 4-way®)), T3 (basal feed + MRF (Actigen™) 800g/ 400g / 200 g+ Drinking water 2 ml / L Combination feed additive (Acid-Pak 4-way®)). The basal diet content were showed in the table 1.

TABLE I. The basal diet content used in study

Feed Nutrient	Content
Dry matter (%)	87.00
Moisture (%)	13.00
Ash (%)	9.00
Crude Protein (%)	20.36
Fat (%)	6.00
Crude fibre (%)	3.00
Ca	1.00 ± 0.25
P	0.70 ± 0.25
Copper (ppm)	30
Zinc (ppm)	120

C. Statistical analysis

The data would be statistically analyzed using the analyses of variance using one-way anova with Completely Randomized Design (CRD) in Minitab® 16th edition. The differences between the means of groups were separated by Duncan Multiple Range Test (P < 0.05).

III. RESULT AND DISCUSSION

A. Growth performance

According to the table showing the broiler diets containing mannan-rich fraction level was presented in table II. There was no difference at the beginning on the initial weight, but at 28 days the body weight increased compared with control (1145.00 and 1180.00 vs. 1010.23 g; P > 0.05). Feed intake was improved in the probiotic treatments compared to the control treatment during 28 d of age (2018.40 vs. 1874.60; P > 0.05). However, There was no deference in the initial weight of broiler chickens (P = 0.99). Microbial communities vary considerably by location along the gastrointestinal tract, e.g., crop, gizzard, duodenum, and ileum share similar bacteria dominated by *lactobacillus*. At the beginning, the broilers adapted the basal diet while the temperature also factors that made the broiler eat more diet. The adapted broilers will increase feed consumption and fulfill the requirement of bodyweight days by days. Venema and Carmo [2] stated if basal diets composition formulated, then theoretically, there should be fewer substrates available for bacteria growth. The greatest success in this site will occur from the developments in feed processing and administration of exogenous feed. In this experiment, the basal dietary formulated may influence the efficacy of mannan rich fraction works because the microbial activities are influenced by digesta composition Spring *et al.* [3].

During the experiment the transition between starter periods and finisher periods rearing the periods of stress occur after diet modifications, this balance can be altered, generally resulting in disturbance of commensal flora. Based on the statement from Di Giola and Biavati [4] the resulting overgrowth pathogenic bacteria can contribute to subclinical

manifestations like decreased feed conversion ratio and production performance or cause clinical sign such as diarrhea. The selection of MOS properties, their administration and usage instructions (like preparation, dosages, and condition of broilers) are crucial for getting fruitful results. The gut microbial affect to digestion, absorption, and metabolism of dietary from the feed formulation through dietary carbohydrates, protein, lipids, and mineral, also the synthesis of vitamins. Most of the volatile fatty acids formed by intestinal bacteria are absorbed by the host, contributing to host energy requirement Di Giola and Biavati [4].

TABLE II. Effect of mannan-rich fraction and probiotics enhanced liquid acidifier on growth performance of female broilers

Treatment	Body weight (28d)
T0	1010.23 ^b
T1	1165.75 ^a
T2	1180.00 ^a
T3	1145.00 ^a
SEM	38.40

TABLE III. Effect of mannan-rich fraction and probiotics enhanced liquid acidifier on growth performance of female broilers

Treatment	Feed intake (28d)
T0	1874.60 ^{ab}
T1	2018.40 ^a
T2	1822.90 ^{ab}
T3	1727.80 ^b
SEM	53.70

TABLE IV. Effect of mannan-rich fraction and probiotics enhanced liquid acidifier on growth performance of female broilers

Treatment	Feed gain (28d)
T0	1.73
T1	1.72
T2	1.54
T3	1.44
SEM	0.23

B. Blood Biochemistry

At the end of the research (28 days old), the several broilers were sacrificed and take blood biochemistry the used probiotic as a feed additive on blood biochemistry while the level of probiotic better more than control (108.75 vs. 101.00 dl; P > 0.05) on total cholesterol. The blood taken from the heart of the broiler taken 5 ml and then immediately centrifuged using the cryogenic centrifuge (Hettich Universal 320R, Germany) for 15min at 3000 rpm to obtain serum and samples were kept in tubes at -20 °C until analyzed.

Reported from Di Giola and Biavati [4] the supplementation in the basal diet with *L. acidophilus* led to the elevated levels of total cholesterol and triglycerides rather than albumin. However, Kirkpinar *et al.* [5] observed no significant difference in serum total cholesterol, albumin, and triglycerides in broiler diets supplemented with or without probiotics (superzist). Lysozyme is an important defense factor against the microbial defense in the immune system. Higher lysozyme activity in the Bacillus act as a probiotics could enhance the antibacterial defense of chicken. Serum

biochemical parameters are usually used as indicators of the physiological status of animals.

An *et al* [6] found that the given the level of probiotic strains increased the amount of alkaline phosphatase activity and significantly reduced levels of ammonia, uric acid level, total cholesterol, and triglyceride in blood serum taken from the heart of broiler. Ammonia, known to be toxic to animals, is a metabolic product of amino acid degradation in the intestine by the action of bacterial ureases. It is absorbed and converted to uric acid in the chicken liver. Suppressing bacterial enzyme activity and ammonia production is beneficial to improve the health and growth performance of animals Di Giola and Biavati [4].

TABLE V. Effect of mannan-riched fraction and probiotics enhanced liquid acidifier on blood biochemistry of female broilers

Treatment	Total cholesterol (28d)
T0	101.00
T1	107.50
T2	108.75
T3	100.25
SEM	8.86

TABLE VI. Effect of mannan-riched fraction and probiotics enhanced liquid acidifier on blood biochemistry of female broilers

Treatment	Triglyceride (28d)
T0	61.75
T1	74.00
T2	85.75
T3	61.75
SEM	36.17

IV. CONCLUSION

The findings from the present experiment context revealed that using mannan rich fraction (MRF) and / or combination with probiotic-enhanced water acidifier as natural growth

promoters (NGPs) can positively affect to growth performance at finisher periods and showing positive responses on total cholesterol, triglycerides. It can be concluded the used of mannan rich fraction (MRF) or combination with probiotic-enhanced water acidifier could be a promising as natural growth promoters (NGPs) in the broiler.

ACKNOWLEDGEMENT

The authors are grateful to the corporation which has facilitated Actigen™ (Alltech Inc., Nicholasville, Kentucky: USA) for the learning process in Taiwan.

REFERENCES

- [1] Jet, S. M., H. Soetanto, O. Sjojfan, and B. Tulung, "The effect of native gedi leaves (*Abelmoschus manihot l. medik*) of northern sulawesi-indonesia as a source of feedstuff on the performance of broilers," *International Journal Bioscience*, vol. 3, issue 1, pp. 82-91, 2013.
- [2] Venema, K. and A. P. D. Carmo, "Probiotics and prebiotics: Current research and future trends," Norfolk, UK: Caister academic press, 2015.
- [3] Spring, P., C. Wenk, A. Conolly, and A. Kiers, "A review of 733 published trials on bio-mos®, a mannan oligosaccharide, and actigen®, a second generation mannose rich fraction, on farm and companion animals," *Journal of Applied Animal Nutrition*, vol. 3, issue 7, pp. 1-11, 2015.
- [4] Di Giola, D., and B. Biavati, "Probiotics and prebiotics in animal health and food safety," Switzerland: Springer, 2018.
- [5] Kirkpinar, F., H. B. Ünlü, and G. Özdemir, "Effects of oregano and garlic essential oils on performance, carcass, organ and blood characteristics and intestinal micro flora of broilers," *Livestock Science*, vol. 137: pp. 219-225, 2011.
- [6] An B. K., B. L. Cho, S. J. You, H. D. Paik, H. I. Chang, S. W. Kim, C. W. Yun, and C. W. Kang, "Growth performance and antibody response of broiler chicks fed yeast derived β -glucan and single-strain probiotics," *Australian Journal Animal Science*, vol. 21, issue 7, pp. 1027-1032, 2008.