THE INTERACTIVE INFLUENCE BETWEEN SEX AND PROBIOTIC ON WHOLE PERIOD'S BROILER USING NON-LINEAR PATTERN AND IN VIVO EXPERIMENT

Danung Nur Adli[1)], Gallusia Marhaeny Nur Isty[2)]
[1)] Animal Nutrition Department, Animal Science Faculty, University of Brawijaya, 65145, East Java, Indonesia
[2)] Animal Science Extension and Welfare Department, Polytechnic Agricultural Development, Manokwari, 98312, West Papua, Indonesia
Email: danungna@ub.ac.id

ABSTRACT

The interactive influence between sex and probiotic on whole period's broiler using non-linear pattern and in vivo experiment; curve growth performance, relatively organ weight of broiler was investigated. First experiment were day-old-chicks of Ross 308 placed among control and experimental. The first experiment were used 56 Ross 308 broiler with aged 35 days including 28 males and 28 females as control, and 28 males and 28 females supplemented with or without probiotics. The second experiment were used non-linear models of Gompertz models to predict between sex and probiotic effect on the growth performance. The data analyses were uses two-way of variance between probiotic and sex (male-female). At the end experiment (35 aged d) thus probiotic and sex were significant difference ($p > 0.05$) on live weight (g), feed intake (g). To sum up, the interaction between group × sex was significant for body weight (g) broiler and non-linear models were effective to comparison between in vivo and predicted models.

Keywords: *Broiler, female, linear regression, probiotic, sex.*

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*Corresponding author:
Danung Nur Adli
Email: danungna@ub.ac.id
Animal Nutrition Department, Animal Science Faculty, University of Brawijaya, 65145, East Java, Indonesia

INTRODUCTION

Generally, poultry rearing keys were depend on breed, feed, and management to purposes the profitable. The golden triangle were gave 86% including also feed intake, live weight, and gain / ratio each breed of broiler. Feed cost were give huge around 65-75% of total productivity in broiler industry. One of small alternatives were used feed additive as replacing antibiotic growth promoters. Antibiotics growth promoters relatively popular among traditional farmer in development country like Indonesia. Although, application of probiotic were lasted more than 25 years in Europe (Adli et al., 2018; 2019). The phase continued, until the European Union represented the regulation No 1831/2003. According to newest regulation PERMENTAN/14/16/2017 Indonesia implementing banned the use of antibiotics both laying hens and broiler (Sjofjan et al., 2019; 2021). The banned were started early periods from first January 2018 (Adli and Sjofjan, 2020a;b). The reason were due to the health, halal, and safety product.

One of the diseases caused by cholesterol is atherosclerosis and coronary heart. It, occurs due to the accumulation of cholesterol in the walls of blood vessels. The current research of probiotic until days still weak and never separated both male and female (Agustiningsih, 2002). Furthermore, the Industries face revolution industry 4.0 which is concept big data occurs. The Gompertz were statistical linear models which are used to define animal body of animal were used to finding broiler body weight. Therefore, were to find interaction influence between of sex and probiotic on curve growth performance, relatively organ weight, in vivo and non-linear models.

MATERIAL AND METHODS

A total of 112 (Ross308) broiler with BW of 37.23± 5.33 gram set for fifth week of in vivo study. The broiler (male and females) were separated gender. The pens designed a randomized completed design. All broiler were keeping in an environmentally controlled with fan intermittent and heater. The housing relatively temperature and humidity among 29°C and 64%, respectively.

Experimental design

The method used in this study was a field experiment with two treatments and four replicates as control and experimental while, sex act as an male and female. The probiotics are divided into four types (table 2). The formulation of feedstuff consisted: maize, dehulled soya bean meal, L-lysine, DL-Methionine, Di calcium Phosphate, Premix mineral, vitamin mineral, choline, limestone, soyoil, and oncom. Feed was reformulation using software.

Data analysis

Data of first experiment were statistically analysed using SAS University version 4.0 red hat (64-bit) and the differences among treatment means ($p < 0.05$) were determined using Duncan's multiple range test among male and female.

Probiotic content analyses and microorganism programmed

The profile of probiotic (table 1) of the Probiotic enhanced liquid acidifier and Probiotic enhanced mannan rich fractions were used quantitative agar technique method (petri dish method). About (ranging from 10^{-3} to 10^{-5}) and then streak onto MacConkey agar plates (Difco Laboratories, Detroit, MI, USA) for the enumeration of *Streptococcus thermopiles. Lactobacillus, bacillus spp, bacillus subtilis,* and *Lactococcus sp* (Medium 222; DSMZ, Braunschweig, Germany). The *Saccharomyces cerevisiae* yeast using chloramphenicol medium. Finalizes, plate were incubated for 24 hours at 37°C (Gao *et al.*, 2017).

Performance measurement

The 56 broilers from group, with range nearest live BW, were separated at the days 35 days broilers will be sacrificed of the experiment. Broilers were slaughtered ready to cook method

Table 1. Ingredient and nutrient composition of the diet

Feed nutrient	Starter (1-21 days)	Finisher (22-35days)
Maize	57.11	69.66
Dehulled soybean meal	36.53	26.65
Betaine	0.55	0.55
Dicalcium phosphate	1.67	1.55
Limestone	1.13	1.02
Salt	0.3	0.3
Soy oil	2.81	0.06
Custom vitamin mix	0.05	0.05
Custom mineral mix	0.05	0.05
	100	100
Dry matter (%)	91.05	86.22
ME (Kcal/kg)	3050	3150
Ash (%)	9.00	9.00
Crude protein (%)	21.00	18.00
Fat (%)	6.00	6.00
Crude fibre (%)	3.00	2.50

Table 2. Microbial profile of probiotics

Determination target	Cell count (cfu/ml)	
	Probiotic enhanced liquid acidifier	Probiotic enhanced mannan rich fractions
Lactobacillus spp	1.0×10^8	3.2×10^{10}
Bacillus spp	2.6×10^5	8.1×10^6
Lactococcus spp	2.5×10^9	2.3×10^7
Bacillus subtilis	6.5×10^{11}	2.1×10^9
S. cerevisiae	5.5×10^{10}	1.0×10^8

RESULTS AND DISCUSSION

According to the Table 3 shows that the control male's broiler were 355 g (11.38%) compared to female on the control. In other hand, the experimental result were better at the amount 100 g (1.03%) rather to female's broiler. The result (table 3) between group x sex for body weight were significant difference ($p > 0.05$). Furthermore in both groups, the body weight gain and feed/gain ration were not significant result ($p < 0.05$) greater numerically trends in males than in females. In addition, (table 3) control males broiler were less eat 142 g (1.05%) vs. (1.01%; 34.86 male broiler). However, the mortality reduces to 0 on experimental than to control. Finalizes, the group x interaction were not significant result ($p < 0.05$) among traits. The increased the broiler body weight during the experiment due to metabolism from the microbial in the probiotic, the enzyme that absorbs nutrient content combine with metabolism to produce and grow the organs in the broiler. Basically, in this experiment result of weight male broiler more heavier than females.

The curve linear of live weight gain may impacted from feed consumption day by days. The curve linear were affected from feeding programmed, one factor when feeding method designed ad-libitum both of sex (male and female) (An et al., 2008). However, relatively of temperature also

helps to increase feed intake during research the average temperature 1-35 days were (26.190 morning and 28.630 afternoon) with humidity (88.940 morning and 88.690 afternoon). The lower temperature at chicken house may help increase feed intake to eat more the experimental diets. Compared to study from Stęczny and Kokoszyński (2020) interactions between sex and probiotic were no interaction for 35 days of age (2880 experimental vs. 2886 control group). Whereas, on their experimental both group and sex were no significant different with statistically number (0.990). In other hand, based on the Manafi et al., (2018) experiment were increasing the body weight (2180 vs. 24560 g).

Table 3. Curve growth performance of broiler in 35-day-old

Group	Sex (n=56)	BW (g)	BWG (g)	FI intake, g/bird	Feed/gain	Mortality (%)
Control	Male	1520[a]	923.80	1668.60[b]	1.48	2.63[a]
	Female	1565[b]	764.25	1810.80[a]	1.54	2.63[a]
	Avg	1515*	844.02	1789.24*	1.50	2.63[a*]
Experimental	Male	1054	934.50	1690.10[ab]	1.44	0[b]
	Female	1054	742.50	1655.24[ab]	1.42	0[b]
	Avg	1021*	838.25	1422.24*	1.41	0[b*]
Pooled SE		24.20	48.60	11.60	0.09	1.31
Group		0.704	0.887	0.776	0.778	1.31
Sex		<0.001	0.564	0.422	0.344	0.22
Group x sex		0.895	0.765	0.988	1.022	<0.001

[a-b] Means within row followed by different superscript differ at $p<0.05$, BW (body weight), FI (feed intake), BWG (body weight gain)

Table 4. Relatively organ weight and immune organs of broiler in 35-day-old

Group	Sex (n=56)	Liver (g)	Spleen (g)	BF (g)	Thymus (g)	Pancreas (g)
Control	Male	46.69	2.61	3.67	9.57	4.44
	Female	47.11	2.28	2.92	9.47	5.55
	Avg	46.90	2.44	3.29	7.87	4.99
Experimental	Male	49.44	3.86	3.32	8.91	3.89
	Female	46.25	2.57	3.01	9.09	3.34
	Avg	47.84	3.21	3.16	9.00	2.33
Pooled SE		7.65	48.60	0.45	0.43	0.021
Group		0.814	0.39	0.111	0.233	0.213
Sex		0.455	0.23	0.123	0.123	0.132
Group x sex		0.785	0.455	0.433	0.322	0.564

[a-b] Means within row followed by different superscript differ at $p<0.05$

According to the Table 4 shows that the relative organ weight and immune organs were did not significant ($p < 0.05$) among control and experimental (male and females); group x sex. Based on the table 4 shows the organs of liver on the control males broiler were 46.69 g (0.99%) more slight than females from the control group, whereas experimental female's broiler weighed 49.44 g (1.06%) more than experimental females. The group × sex interactions for liver, spleen, bursa of fabricius, thymus, and pancreas (g) were no significant difference ($p < 0.05$) (Table 4). The data listed in Table 4 showed that the use of two kind probiotic did not have a significant effect on relative organ weight and immune organ. In both groups, relative organ weight and immune organ were did not significant ($p < 0.05$) greater numerically trends in males than in females. In addition, the bursa of fabricius and thymus as immune organ at control

males broiler were higher 3.67 g (1.25%; bursa of fabricius) and (1.01%; thymus) than females from the same group. However, the group × sex interaction was not significant ($p < 0.05$) for the above parameter. In some studies according to Manafi et al., (2018) on it result were not increase on liver and spleen both male and female groups ($p > 0.05$), where areas, bursa of fabricius as immune organ were increase ($p < 0.05$). The higher immune organs result were supposes to microorganism activities either mode of action and immune stimulation. The factors affected to the significantly different of the stomach is the ability of the absorption. Goo et al., (2019) stated the variance of the broiler are effect to the absorption and the capacities of the stomach.

CONCLUSION

To sum up, the interaction between group × sex was significant for body weight (g) broiler and non-linear models were effective to comparison between in vivo and predicted models.

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