THE EFFECT OF PROBIOTIC (VIZYME) ON PRODUCTION AND QUALITY PERFORMANCE OF LUONG PHUONG LAYERS

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SUMMARY

This study was conducted to evaluate the effect of probiotic – vizyme (VIZ) on reproduction performance of Luong Phuong (LP) layers. A total of 144 LP pullets of 16 weeks old were divided into 12 groups, each with 12 pullets. These were randomly assigned to 4 treatments containing 0, 0.5, 1.0 and 1.5 g of VIZ/liter of drinking water in completely randomized design with 3 replications for a study period of 22 weeks. Feed consumption, feed conversion ratio, egg production, egg quality, fertility, and hatchability were used as evaluation parameters. The results obtained showed that there was no significant difference among all the treatment groups in feed consumption, sexual maturity, survival rate and feed conversion efficiency (P>0.05), whereas the mean body weight gain of the groups of 24 weeks placed on the treatment containing 1.0 to 1.5 g of VIZ/liter were significantly (P<0.05) higher than the control groups. The results obtained also showed that there was no significant (P>0.05) difference between all the treatment groups of layers in feed consumption, fertility and hatchability (P<0.05) to an age of 37 weeks. On the other side, the mean weekly egg production and feed conversion efficiency during the laying period were significantly higher (P<0.05) for the groups of layers placed on the treatment containing 0.5 to 1 5 g of VIZ/liter compared to that of the groups placed on the control treatments. In summary, the results of this study showed that inclusion of 0.5 to 1.5 g of VIZ/liter resulted in significant improvement in survival and growth rate, egg production, feed conversion ratio and egg quality parameters.

Key words: *Egg production and egg quality, probiotic, vizyme, feed conversion ratio, Luong Phuong (LP) chickens.*

INTRODUCTION

Luong Phuong breed is dual purpose chicken breed, it was imported into Vietnam from China in 1997. The LP breed of chickens distributed were reported to be capable of well acclimatization to the Vietnam rural production environment with reasonable production level under smallholder management systems. However, there have been serious complaints by the farming community and the multiplication centers, suggesting that the production performance of LP breeds of chickens is *medium* as measured by age at sexual maturity, rate of egg production, fertility and hatchability. Vizyme are one kind of probiotic products, it producted by Alibaba Group (USA). The probiotic has a role in nutrition particularly in the area of detoxification of certain compounds, stimulation of animal growth, and improvement of the health status and well-being of the host animals through protection against pathogenic bacteria (Tran Quoc Viet et al., 2009; Van der Wielen et al., 2002). The improvement in production performance of poultry fed on the ration containing VIZ was reported to be attributed to the improvement in feed bioavailability, balance of gastrointestinal micro-organisms, and enhancement of the immunity status of the birds (Ahbaba Group – USA, 2015). Inclusion of VIZ dominated by Lactobacillus acidophilus in laying hens diets was reported to have improved some quantitative and qualitative parameters of eggs. There has been an increase in the number of laid eggs, decrease in feed intake, improvement in feed conversion ratio, egg specific gravity and an increase in the Haugh Units (Daniele et al., 2008). Panda et al. (2008) reported significant increase in the egg production performance of White leghorn layers with dietary

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supplementation of a probiotic at the rate of 100 mgkg 1 diet (6×10^8 spores). All these probiotics effects showed that the use of standardized would have improvement effect on layers.

MATERIALS AND METHODS

Description of experimental site

This experiment was conducted from May to November, 2015 at Hai Yen farm, Song Cong City, Thai Nguyen province. The mean maximum and minimum temperature of the study area was 33.5 and 24.4°C, respectively and the mean maximum and minimum relative humidity was 91.4 and 64.6 % respectively.

Experimental treatments

Vizyme are one of popular probiotic products of Alibaba Group (USA).

Composition: Lactase: 48,000 mcg; Vitamin C: 30,000 mg; Microbial produce lactid acid: 60.10^{12}CFU; Sodium: 20,000mg Bacillus subtilis; 5.10^{10}– 10^{11}CFU; Potassium: 13,000 mg; Lactobacillus spp: 2.10^{10}– 10^{11}CFU; Exp:1,000 g

Management of the experimental birds

A total of 200 pullets at an age of 12 weeks were purchased from National Institute of Animal science, Hanoi. These were housed in well prepared grower's house and placed on grower's commercial ration. At 16 weeks of age, 144 pullets were divided into 12 groups, each with 12 pullets Two cockerels of the same age and breed were assigned to each group and each group was housed in separate pens of equal dimension that were properly cleaned, disinfected, and provided with all the necessary layers house equipments in advance. Finally, the 4 treatments were randomly assigned to the experimental pullets with 3 replications for the study period of 22 weeks (Table 1). At 5 months of age, all the treatment groups were switched to commercial layers ration; the feed composition is a secret of the factory, quality feed manufacturing factory. All the treatment groups were fed to appetite and chlorine free water containing different levels of VIZ (treatments) was made available at all times.

Egg quality determination

Twelve eggs laid during the last three consecutive days of the 7 weeks laying period were randomly selected from each treatment. The eggs were individually weighed, carefully opened (broken) onto a flat plate and the yolk and albumen were separately weighed. Yolk height was measured using tripod micrometer (0.01 mm gauge) and yolk index was calculated according to the method described by Tran Thanh Van et al. (2015). Egg shell thickness was measured using calibrated micrometer screw gauge. Yolk color was measured using roach color fan. Haugh unit was calculated using the formula adopted from the study of Haugh (1937).

Table 1. *Treatment allocation to the experimental birds*

Treatments	Rep/Treat.	Chicks/Rep	Total
0 g of VIZ/Liter of drinking water, control (T1)	3	12	36
0.5 g of VIZ/Liter of drinking water, (T2)	3	12	36
1.0 g of VIZ /Liter of drinking water, (T3)	3	12	36
1.5 g of VIZ /Liter of drinking water, (T4)	3	12	36
Total	**12**	**48**	**144**

Table 2. *Feed consumption (g/head) of pullets placed on different levels of VIZ.*

Age (week)	T_1	T_2	T_3	T_4	S.E	P-value
16	513.05	518.85	515.26	476.90	21.38	>0.05
18	571.55	552.95	545.30	551.90	10.84	>0.05
20	593.60	577.50	565.95	589.40	10.52	>0.05
22	632.45	603.40	583.45	614.95	21.07	>0.05
24	678.7	647.15	604.10	651.70	11.01	>0.05
Average	599.04	582.48	561.24	579.72	9.92	>0.05

S.E = standard-error; Means in a row without superscripts are statistically not significant (p>0.05). T1 = Control; T2 = 0.5 g of VIZ/liter of water; T3 = 1.0 g of VIZ/liter of water; T4 = 1.5 g of VIZ/liter of water.

Fertility and hatchability determination

Fifty fresh eggs (stored for 7 days) were taken from each treatment, selected against undesirable shape, size and shell structure and incubated. The eggs, incubator and all the fixtures were fumigated with formalin plus potassium permanganate (Altman et al., 1997).

The incubation temperature, humidity and turning device were adjusted in advance according to the recommendations of the manufacturer. Candling was done on the 7th and 14th day of incubation aimed at calculating fertility and hatchability.

Statistical analysis

Since repeated data were collected on the same animal daily/weekly it was appropriate to use Repeated Measures Design (RMD). Data on body weight gain, feed consumption, feed conversion ratio, sexual maturity, and rate of egg production, egg quality, fertility and hatchability were collected throughout the study period. The data collected were subjected to Repeated Measures Design (RMD) of SAS 9.00 version for analysis (SAS Institute, 2002). Least square mean were used for comparison.

RESULTS AND DISCUSSION

Feed consumption during growing

There was no significant (p>0.05) difference between all the treatment groups in mean weekly feed consumption to an age of 24 weeks, though the groups receiving 0 g of VIZ/liter of drinking water tended to consume more than the others (Table 2). The other treatment groups showed proportional reduction in feed consumption as a result of increase in the volume of VIZ administered /liter of drinking water.

Similarly there was no significant difference between (P>0.05) all the treatment groups in weekly body weight gain during the first 5 weeks of the feeding trial. Weekly body weight gain brought by the treatment groups assigned to the control treatment was significantly (P<0.05) lower than the groups placed on the treatment containing 1 0 to 1.5 g of VIZ/liter of drinking water during the last 4 weeks of feeding. There was no significant difference between the treatment groups assigned to 1.0 to 1.5 g of VIZ/liter of drinking water in weekly body weight gain and feed conversion efficiency at any time of the feeding trial (Tables 3 and 4).

Significant (P<0.05) difference in mean daily body weight gain between the treatment groups of pullets was recorded after 5 weeks of the feeding trial whereas: there was no significant difference in feed consumption between all the treatment groups at any time The results of this study are in agreement with that of Kalavathy et al. (2003) who

reported improved body weight gain of broiler with supplementary administration of Lactobacillus. Mean weekly feed consumption of T1, T2, T3 and T4 833.89, 793.85, 766.07 and 754.36 g head was attained by the groups placed on 0, 4, 8 and 12 ml of VIZ/liter of drinking water respectively (Table 5).

Similar trend was also reported by Balevi et al. (2009) from the trial conducted to study the effect of dietary supplementation of commercial.

Feed consumption of layers

Significant (P<0.05) difference between the groups of treatment in pullets was recorded after the 1st 5 weeks of the feeding trial. The results of this study are in agreement with that of Kalavathy et al. (2003) who reported improved body weight gain of broiler with supplementary administration of Lactobacillus. Mean weekly feed consumption of T1, T2, T3 and T4 833.44, 798.85, 776.07 and 764.38 g head was attained by the groups placed on 0, 0.5, 1.0 and 1.5 g VIZ/liter of drinking water respectively. Similar trend was also reported by Balevi et al. (2009) from the trial conducted to study the effect of dietary supplementation of commercial probiotic (ProtexinTM) containing either 0, 250, 500 or 750 ppm on egg production performance. The researchers reported the highest daily feed consumption from the control group.

Table 3. *Body weight gain (g/head) of pullets placed on different level of VIZ*

Age (week)	T_1	T_2	T_3	T_4	S.E.	P-value
Initial	875.45	868.00	844.65	824.45	5.17	>0.05
16	71.02	73.30	68.80	73.80	6.69	>0.05
18	235.33	269.86	283.47	290.18	14.30	>0.05
20	388.56	476.84	526.45	496.83	19.80	>0.05
22	538.39^{b}	629.04^{ab}	689.14^{a}	655.05^{ab}	17.38	< 0.05
24	674.62	780.56^{ab}	848.08^{a}	799.90^{ab}	18.86	< 0.05
Average	376.68b	446.87^{ab}	487.70^{a}	464.92^{a}	14.56	< 0.05

S E = standard-error; ^{ab} *Means within rows for different group with different superscripts differ (P < 0.05)*

Table 4. *Feed conversion ratio of pullets placed on different levels of VIZ*

Age (week)	T_1	T_2	T_3	T_4	S.E.	P-value
16	7.33	7.24	7.39	6.26	0.30	>0.05
18	7.28	5.06	4.53	4.37	0.41	>0.05
20	7.38	5.59	5.15	5.96	0.55	>0.05
22	8.44	8.32	6.98	8.67	0.50	>0.05
24	9.42	8.70	8.52	9.33	0.50	>0.05
Average	8.10	6 95	6.28	6.85	0.47	>0.05

S E = standard-error; Means in a row without superscripts are statistically not significant (P>0.05)

Table 5. *Feed consumption of layers placed on different levels of VIZ (g/head)*

Age (week)	T_1	T_2	T_3	T_4	S.E.	P-value
25	690.05	659.95	634.56	654.10	22.19	>0.05
27	758.80	667.10	690.55	667.80	62.80	>0.05
29	832.65	773.15	753.20	714.00	31.97	>0.05
31	866.85	834.25	795.88	767.65	21.36	>0.05
33	873.65	849.95	816.20	798.10	18.12	>0.05
35	893.90	971.80	835.80	828.40	15.88	>0.05
37	906.11	884.81	851.55	847.72	11.42	>0.05
Average	833.44	798.85	776.07	764.38	32.97	>0.05

S.E = standard-error; Means in a row without superscripts are statistically not significant (p>0.05).

Egg production

Age at the first egg of all the treatment groups ranged between 177 and 183 days and there was no significant difference (P>0.05) between all the treatment groups in sexual maturity as measured by the age at the first egg. All the treatment groups seem to be slightly late in sexual maturity, probably attributed to higher body weight attained during the growing (pullet) period. The results obtained also showed that the mean weekly egg production performance of all the treatment groups was low by any standard (Table 6). Weekly egg production on the 13th week of laying was 3.66, 4.14, 3.34 and 3.15 for the treatment groups assigned to 0, 0.5, 1.0 and 1.5 g of VIZ/liter of drinking water respectively. The group receiving 0.5 g of VIZ /liter of drinking water was significantly higher (p<0.01) in egg production than the others. These groups attained daily egg production of 59.14% (0.59 egg/day/head or 4.14 egg/week/head) at an age of 37 weeks, indicating that the daily egg production performance of the experimental chicken improved by 13.11% as a result of administration of 0.5 g of VIZ/liter of drinking water as compared to the control groups (T_1). On the contrary, the administration of 1.0 to 1.5 g of VIZ/liter of drinking water tended to depress mean weekly egg production. In line with the results of this study, Panda et al. (2008) reported significant increase in the egg production performance of White leghorn layers with dietary supplementation of a probiotic (L. *sporogenes)* at the rate of 100 mg/ kg of diet. However, no further benefit in egg production was noticed by increasing the level of probiotic supplementation from 100 to 150 mg/ kg of diet. Panda et al. (2008) and Kurtoglu et al. (2004) reported that the addition of EM at a rate of 100 or 200 mg/kg of feed resulted in significant improvement in egg production. According to Nahashon et al. (1994) layers fed diets supplemented 0, 1100, and 2200 ppm Lactobacillus produced 88.9, 90.4, and 89.5%, hen-day egg production respectively and the egg production value attained by the groups fed on diet supplemented by 1100 ppm Lactobacillus was significantly higher than that of the control (P<0.05).

Table 6. *Egg production of the layers placed on different levels of VIZ*

Age (week)	T_1	T_2	T_3	T_4	P-value	CV
Sexual Maturity (days)	177.6	178.5	183.0	183.5	> 0.05	4.15
25	0.32	0.34	0.34	0.24	> 0.05	42.04
27	$1.53a^b$	1.95^a	1.54^{ab}	0.86^b	< 0.01	21.84
29	2.43^b	3.12^a	2.51^b	1.60^c	< 0.05	9.34
31	$2\ 97^{ab}$	3.46^a	2.72^b	2.22^b	< 0.05	9.96
33	3.30^{ab}	3.55^a	2.84^{bc}	2.42^c	< 0.05	6.00
35	3.42^{ab}	3.71^a	3.09^{bc}	2.67^c	< 0.05	5.52
37	3.66^b	4.14^a	3.34^{bc}	3.15^c	< 0.01	4.08
Average	2.52^b	2.95^a	2.35^b	1.88^c	< 0.001	2.96

CV = Coefficient of Variation; $^{a\,b\,c}$ Means within rows for different group with different superscripts differ (P < 0.01 to 0.05).

Table 7. *Feed conversion ratio (feed consumed/ kg of eggs produced) of the layers placed on different levels of VIZ*

Age (week)	T_1	T_2	T_3	T_4	P-value	CV
25	35.28	24.87	24.55	38.87	>0.05	44.22
27	6.54	4.09	5.48	9.81	>0.05	36.95
29	4.36	3.47	3.94	6.64	>0.005	5.72
31	2.98	3.59	4.41	4.43	>0.05	11.76
33	3.20	2.92	3.49	4.13	>0.05	9.18
35	3.14	2.83	3.26	3.76	>0.05	9.49
37	3.00	2.56	3.08	3.36	>0.05	5.51
Average	3.96	3.25	3.92	4.80	>0.05	3.89

CV = Coefficient of Variation; Means in a row having similar superscript are statistically not significant (p>0.05).

Feed conversion ratio

The amount of feed consumed/ kg or dozen of eggs produced was lowest (Table 7). The result showed that treatment level containing 0.5 g of VIZ/liter of drinking water consumed significantly less amount of feed (kg) / kg of eggs produced and produced at cheaper rate than all the others (P<0.05). This shows that the use 0.5 g of VIZ of /liter of drinking water seems to have significant economic implication when used at relatively large scale poultry production. This result seems to be in line with that of Dahal (1999) who reported that the use of EM (either in water or feed) in broiler production was found to be safe and profitable. Higher profit per bird from the use of EM in water as compared to the use of EM in feed due to additional cost of bokashi preparation was reported by Nguyen Thi Thuy Hien (2010); Nguyen Duy Hoan et al. (2001).

Egg quality, fertility and hatchability

The Haugh unit, yolk and albumen height recorded from eggs collected from the groups placed on the control treatment were significantly lower (p<0.05) than that recorded from the eggs collected from all the others. In agreement with this result, an increase in the Haugh Units (P<0.05) have been recorded by Daniele et al. (2008) with the use of probiotics.

Table 8. *Quality, fertility and hatchability of eggs collected from the layers placed on VIZ*

Parameter	T_1	T_2	T_3	T_4	P-value	CV %
Egg length (cm)	5.79	5.61	5.64	5.65	>0.05	0.18
Egg breadth (cm)	4.26	4.25	4.26	4.27	>0.05	1.17
Egg volume	59.37	58.67	59.50	58.78	>0.05	3.03
Egg weight (g)	56.08	56.34	56.66	56.62	>0.05	3.19
Haugh unit	52.31^a	61.50^b	64.97^b	63.51^b	< 0 05	5.91
Yolk height (mm)	12.60^a	14.19^b	14.26^b	14.16^b	< 0.05	2.17
Yolk diameter (cm)	3.64	3.70	3.68	3.72	>0.05	2.23
Yolk index	0.349	0.384	0.389	0.380	>0.05	4.15
Yolk color	1	1	1	1	>0.05	0 00
Yolk weight (g)	13.49	13.74	13.89	14.09	>0.05	4.69
Albumen height (mm)	3.34^a	4.04^{ab}	4.63^b	4.32^b	< 0.05	8.02
Albumen weight (g)	35.80	34.795	35.51	34.88	>0.05	8.02
Shell thickness (mm)	0.359	0.355	0.335	0.372	>0.05	6.12
Shell weight (g)	5.49	5.49	5.57	5.55	>0.05	5.27
Fertility (%)	92.01	94.00	93.93	93.58	>0.05	3.12
Hatchability (%)	79.14	78.33	81.30	82.26	>0.05	9.60

CV = Coefficient of variation; $^{a\,b}$*Means within rows for different group with different superscripts differ (P < 0.05)*

Similarly, Yousefi and Karkoodi (2007), reported improvement in egg quality, as a result of addition of 100 to 750 mg of probiotic /kg of feed. As shown in Table 8, there were no significant difference between eggs collected from all the treatment groups in fertility and hatchability.

CONCLUSION

Even though, better egg quality and lower feed consumption were obtained from 1.0 g of VIZ/liter of water treated groups due to higher egg production, FCR/kg of egg mass, 0.5 g VIZ treatment could provide better production than any of the treatment levels. Since VIZ showed insignificant difference for pullet, it is economical not to provide VIZ for this age group. However, 0.5 g of VZ/liter of water showed better performance of egg production and egg quality, provision of this amount of VIZ fifteen days before onset of egg lay up to the end of production period would be economical. Since weight gain of females LP growers performed better at 1.0 g of VIZ/liter of water while males LP grew best at 1.5 g of VIZ/liter water. There is a need for further investigation to determine such level of VIZ for broiler type breeds.

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TÓM TẮT

ẢNH HƯỞNG CỦA BỔ SUNG PROBIOTIC –VIZYME ĐẾN NĂNG SUẤT VÀ CHẤT LƯỢNG TRỨNG GÀ LƯƠNG PHƯỢNG

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Nghiên cứu được tiến hành nhằm đánh giá ảnh hưởng của probiotic - vizyme (VIZ) đến năng suất sinh sản của gà Lương Phượng (LP) giai đoạn 16 đến 37 tuần tuổi. Sử dụng 144 gà LP lúc 16 tuần tuổi, chia thành 12 nhóm, mỗi nhóm 12 con. Gà thí nghiệm được chia ngẫu nhiên thành 4 lô tương ứng với 4 mức bổ sung VIZ: 0; 0,5; 1,0 và 1,5 g VIZ / lít nước uống, với 3 lần lặp lại, thời gian nghiên cứu 22 tuần. Các kết quả nghiên cứu cho thấy bổ sung probiotic - vizyme không ảnh hưởng tới các chỉ tiêu tỷ lệ sống, tiêu thu thức ăn, tuổi đẻ, tỷ lệ đẻ và tỷ lệ nở (P> 0,05). Với mức bổ sung 1,0 -1,5 g VIZ/lít nước uống sẽ nâng cao khả năng sinh trưởng so với các lô còn lại với (P <0,05). Mặt khác, bổ sung từ 0,5 đến 1,5 g VIZ/lít nước uống làm tăng năng suất trứng, các chỉ tiêu chất lượng trứng và giảm tiêu tốn thức ăn cho sản xuất trứng so với lô đối chứng.
Từ khóa: *Năng suất trứng, chất lương trứng, probiotic, vizyme, tiêu thu thức ăn, gà Lương Phượng.*

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