



Effect of Probiotics on production and egg quality of dual purpose chicken at Kathmundu in Nepal

Neupane D^{1*}, DB Nepali², N Devkota², MP Sharma² and IP Kadaria²

¹Swine and Avian Research Program, Khumaltar, NARC, Nepal; ²Agriculture and Forestry University, Chitwan, Nepal

Abstract

A total of 448, Sakini (224) and Giriraja (224) breed of chickens were used to investigate the feed intake & weight gain from 0-150 days and egg production and egg quality from 150 – 240 days of age in Khumaltar Lalitpur Nepal. The four different levels of probiotics viz. 0, 5, 10 and 15 ml of Probiotic (Poultry biosa)/kg of feed were used with randomized factor design 2*4*8(RBD) with 8 treatments and 8 replications. The data was recorded daily on feed intake and egg production and in every 15 days interval for weight gain. Results showed that the addition of probiotic to the feed significantly improved feed intake, weight gain, egg production and egg quality on sakini and giriraja breeds of chickens ($P < 0.05$). Additionally, data on egg production and egg quality showed increased production in treatment group than control group ($P < 0.05$). The general trend revealed increasing level of egg production from five to eight months with significant difference ($P < 0.05$). Nutrient analysis of eggs by proximate analysis in terms of CP, CF, fat and energy showed significant difference ($P < 0.05$). Thus to conclude, there is positive effect of probiotics for production and productivity in terms of feed conversion ratio, weight gain, egg production & egg quality in Sakini and Giriraja breed of Chicken.

Key words: Probiotic, Sakini, Giriraja, Feed intake, Weight gain, Egg production, Egg quality

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Introduction

Poultry production is an important and diverse component of agriculture all over the world (Kabir *et al.*, 2004). In large-scale rearing facilities, where poultry are exposed to stressful conditions, problems related to diseases and deterioration of environmental conditions often occur and result in to serious economic losses (Jin *et al.*, 1998). Prevention and control of diseases have led during recent decades to a substantial increase in the use of veterinary medicines. However, the utility of antimicrobial agents as a preventive measure has been questioned, given extensive documentation of the evolution of antimicrobial resistance among pathogenic bacteria (Jin *et al.*, 1998). So, the possibility of antibiotics ceasing to be used as growth stimulants for poultry and the concern about the side-effects of their use as therapeutic agents has produced a condition in which both consumer and manufacturer are looking for alternatives. Probiotics are being considered to fill this gap and already some farmers are using them in preference to antibiotic (Kalavathy *et al.*, 2003). Adding the so-called beneficial bacteria to the digestive tract of poultry is not a new concept, however, a complete understanding of where, when and how to use them still has a subject of research. A strikingly

crucial event in the development of probiotics was the finding that newly hatched chickens could be protected against colonization by *Salmonella enteritidis* by dosing a suspension of gut contents derived from healthy adult chickens (Mountzouris *et al.*, 2007). However, a complete understanding of where, when and how to use them still has escaped us in especially in the context of developing countries like Nepal. Thus the present study was done using four different levels of probiotics (0, 5, 10 and 15 ml.) in two different breeds of chickens viz. Sakini and Giriraja with the objective to assess the effect of probiotics for feed conversion, weight gain, egg production & egg quality in Sakini & Giriraja breed of chicken.

Materials and Methods

Experimental design and bird management

A total of 448 day-old chicks of Sakini and Giriraja breed in the farm of SARP, Khumaltar were used for experiment. The design of the experiment was randomized factor design 2*4*8 (RBD) with 8 treatments and 8 replications. There were 64 experimental units and each experimental unit comprised 7 birds. The size for each cage was 4*3 feet. The birds were provided *ad libitum* feed as recommended for different age

*Corresponding author: damodarneupane@gmail.com

group. These were evaluated for Feed Conversion ratio, weight gain, egg production & egg quality.

Data collection and Statistical analysis

The body weight of each experimental bird was collected fortnightly and the feed consumption & egg collection record were done daily. The treatment with probiotic (poultry Biossa) at

different level was considered as independent factor and the feed intake, body weight and FCR were taken as dependent factor. Data was analysed following the general linear model (one way ANOVA) procedure of SPSS ver20.0 and the post-hoc comparison of means was made using Duncan’s multiple range test. Significance was considered at $P < 0.05$.

Results & Discussion

Feed Intake, weight gain and FCR for 0-60 days

Table 1. ANOVA table for feed intake, Weight gain and FCR for 0-60 days

Treatment No.	Feed Intake in Kg. (mean±SE)	Weight in Kg. (mean±SE)	FCR
1	9.57±1.59 ^{cd}	3.3 ± 0.89 ^d	2.9
2	8.08 ±1.51 ^d	3.3± 0.44 ^d	2.4
3	10 ± 2.60 ^c	4.16±0.56 ^c	2.4
4	9 ± 0.14 ^d	3.24±0.74 ^d	2.7
5	19 ±0.71 ^b	7 ± 0.17 ^b	2.5
6	17.75 ±0.27 ^b	7.1 ±0.61 ^b	2.5
7	19 ± 0.15 ^a	8.2 ± 0.31 ^a	2.3
8	19.92 ± 8.3 ^a	8.3 ±0.97 ^a	2.3
P Vallue	0.000	0.01	
Level of Sig.	**	**	

Note: SE= Standard error , FCR= Feed Conversion ratio **= level of significance at 95%

Results from the study from day 0-60 revealed that there is no significant difference ($P < 0.05$) for weight gain and FCR but there is significant effect for feed intake with different level of treatment with Biossa. As T8 (Biossa -15 ml) for Giriraja and T3(Biossa- 10ml) for Sakini has shown the highest level of feed intake and the (T6 and T7/ Giriraja) and (T1 and T2 / Sakini) has shown the lowest level for the same. Similarly, T1/Giriraja

(Control)and T3 /Sakini (Biossa-10ml) showed highest level of weight gain and T6/ Giriraja(Biossa-10ml) and T4 Sakini (Biossa-10ml) group showed the lowest weight gain. The highest value for FCR was observed in T7/Giriraja group(Biossa-10ml) and T4/ Sakini group (Biossa-15ml) and the lowest FCR value was observed in T6/ Giriraja(Biossa-5ml) and T2/ Sakini group (Biossa-5ml).

Feed Intake, weight gain and FCR for 61-90 days.

Table 2. ANOVA table for feed intake, Weight and FCR for 61-90 days

Treatment No.	Feed Intake in Kg. (mean±SE)	Weight in Kg (mean±SE)	FCR
1	14.62 ± .082 ^b	4.0± 0. 01 ^{bc}	3.25
2	12.02. ± 0.83 ^c	4.25 ± 0.08 ^c	2.83
3	12.14±. 0.55 ^{bc}	4. 4± 0.08 ^c	2.76
4	11.84 ± 0.19 ^b	4.10± 0.10 ^{bc}	2.89
5	28.67 ± 0.94 ^{ab}	9..72 ±0.03 ^b	2.95
6	25.76± 0.09 ^a	11.20± 0.14 ^a	2.30
7	25.76± 0.69 ^a	11.29± 0.06 ^a	2.28
8	29.32± 0.18 ^a	11.50± 0.07 ^a	2.55
P value	.000	.04	
Leve l of sig.	**	**	

Note: SE= Standard Error, **= Significant at 0.5% level, FCR= Feed conversion ratio

Results from the study from day 61 -90 days revealed that there is significant difference ($P<0.05$) for feed intake, weight gain and FCR with different level of treatment with Biosa . As T8 and T7 (Biosa -15 ml and 10 ml) for Giriraja and T3(Biosa- 10ml) for Sakinihas shown the highest level of feed intake and the T6 and T7/ Giriraja(Biosa- 5ml and 10ml) and (T1 and T2 / Sakini(control and Biosa- 10ml) has shown the

lowest level for the same. Similarly, T8/Giriraja(Biosa- 15ml) and T3 /Sakini(Biosa- 10ml) showed highest level of weight gain and T5/ Giriraja (Control) and T1Sakini group (Control) showed the lowest level of weight gain. The highest value for FCR was observed in T7/Giriraja group and T4/ Sakini group and the lowest FCR value was observed in T6/ Giriraja(Biosa-5ml) and T3/ Sakini (Biosa-10 ml) group

Feed Intake , weight gain and FCR for 91-120 days.

Table 3. ANOVA table for feed intake, Weight and FCR for 91-120 days

Treatment no.	Feed Intake in Kg. (mean±SE)	Weight in Kg. (mean±SE)	FCR
1	21.25 ± 0.82 ^c	6.5 ± 0.08 ^{bc}	3.27
2	19.26 ± 0.83 ^c	6.4± 0.10 ^c	3.01
3	21.73 ± 0.55 ^{bc}	6.9 ± 0.08 ^c	3.10
4	21..73± 0.19 ^b	6.9 ± 0.05 ^{bc}	3.15
5	43.66 ±0.94 ^a	14.8 ± 0.32 ^b	2.95
6	39.32± 0.94 ^a	14.3 ± 0.14 ^a	2.75
7	41.78± 0.69 ^{ab}	15.14 ±.06 ^{ab}	2.76
8	41.86± 0.18 ^a	15.28 ±.07 ^a	2.74
P value	.00	.04	
Level of sig.	**	**	

Note: SE= Standard Error, **= Significant at 0.5% level, FCR= Feed conversion ratio

Results of the study from 91 -120 days revealed that there is significant difference ($P<0.05$) for feed intake and weight gain with different level of treatment with Biosa. As T8 (Biosa -15 ml) for Giriraja and T2(Biosa- 5ml) for Sakinihas shown the highest level of feed intake and the T5Giriraja(Control group) and T3 / Sakini(Biosa-10ml) has shown the lowest level for the same. Similarly, T8/Giriraja(Biosa- 15ml) and T3

/Sakini(Biosa- 10ml) showed highest level of weight gain and T5/ Giriraja (Control) and T1 Sakini group (Control) showed the lowest level of weight gain. The highest value for FCR was observed in T8/Girirajagroup(Biosa-15ml) and T4/ Sakini group and the lowest FCR value was observed in T6/ Giriraja(Biosa-5ml) and T2/ Sakini (Biosa-5 ml) group.

Feed Intake , weight gain and FCR for 121-150 days.

Table 4: ANOVA table for feed intake, Weight gain and FCR for 91-120 days

Treatment	Feed Intake (mean±SE)	Weight (mean±SE)	FCR
1	32.90± 0.83 ^b	9.40 ± 0.03 ^c	3.5
2	32.64± 0.80 ^b	9.60 ± 0.04 ^c	3.4
3	33.46±0. 09 ^b	10.65 ± 0.05 ^c	3.45
4	33.46± 0. 03 ^b	9.70 ± 0.03 ^c	3.45
5	52.75± 0.64 ^a	15.47± 0.14 ^b	3.41
6	54.19± 0.13 ^a	16.78 ± 0.11 ^b	3.23
7	52.63 ± 0.41 ^a	17.2 ± 0.13 ^a	3.06
8	54.27± 0.50 ^a	18.09 ± 0.03 ^a	3.0
P value	0.000		
Level of significance	**	**	

Note: SE= Standard Error, **= Significant at 0.5% level, FCR= Feed conversion ratio

Results from the study from 121 -150 days revealed that there is significant difference ($P < 0.05$) for feed intake and weight gain with different level of treatment with Biosa . As T8(Biosa -15 ml) for Giriraja and T2(Biosa- 5ml) for Sakinihas shown the highest level of feed intake and the T5Giriraja(Control group) and T1 / Sakini(Control) has shown the lowest level for the same. Similarly, T8/Giriraja (Biosa- 15ml) and T3 /Sakini(Biosa- 10ml) showed highest level of weight gain and T5/ Giriraja (Control) and T1 Sakini group (Control) showed the lowest level of weight gain. The highest value for FCR was observed in T6/Giriraja group (Biosa-ml) and T3/ Sakini group and the lowest FCR value was observed in T8/ Giriraja(Biosa-15ml) and T4/ Sakini (Biosa-15 ml) group.

Results from this study revealed that there is significant effect of probiotics ($P < 0.05$) for feed intake, weight gain and FCR except early 60 days. The Probiotic incorporated @ 15 ml has shown the highest level of intake , weight and FCR compared to other treatments and control. The finding is in line with different researchers. As, Pelicano et al. (2004) used two commercial probiotics, the first composed with *Bacillus subtilis* (150 g/ton feed) and the second with *Lactobacillus acidophilus* and *casei*, *Streptococcus lactis* and *faecium*, *Bifidobacterium bifidum* and *Aspergillus oryzae* (1 kg/ton feed) for broilers in the period of one to 14 days of age and observed an improvement in feed conversion up to 21 days of age in animals receiving probiotics, regardless of the composition, in relation to the group without any addition. Cao et al. (2013) found that supplementation the broiler diets with a single strain of *Lactobacillus (Enterococcus faecium)* significantly improved the BW and BWG compared to the control. Kalavathy et al. (2003) found an improvement in body weight gain (BWG) and feed conversion ratio (FCR) of broilers fed a mixture of different *Lactobacillus* strains from 1 to 42 days of age. Similarly, Improvement in the performance of broilers has been reported by several researchers (Dilworth & Day, 1978; Jin et al., 1996; Mohan et al., 1996; Yeo & Kim, 1997; Santoso et al. 1995; Jin et al., 1998a; Cuevas et al., 2000; Fritts et al., 2000; Kabir et al., 2004; Huang et al., 2004; Schocken-Iturrino

et al., 2004; Gil de los Santos et al., 2005; Mountzouris et al., 2007; Rigobelo et al., 2011). However, some contrasting results are obtained by (Loddi et al. 2000; Lima et al. 2003; Willis & Reid, 2008) have not shown any benefit for the use of probiotics in any breeding phase of broilers. This might be due to duration, little knowledge on minimum required dose and various others. As, Siriken et al. (2003), stated that the duration of treatment can be an important factor in the effect of a probiotic on the intestinal microbiota, once probiotics can be given only once or periodically, in weekly or daily intervals. Similarly, (Cole & Fuller, 1984; Goldin & Gorbach, 1984) also agreed that the little knowledge regarding the minimum required dose to evidence the effects of probiotics, experiments in mice, humans and pigs have indicated that the effect decreases when the probiotic is discontinued

Additionally, Giriraja Breed has shown the highest level of feed intake, weight gain and FCR compared to Sakini has shown the lowest for the same within the given duration of the experiment. The findings agree with that of Aryal and Neopane (1997) as they observed 2.8 and 3.68 FCR for Giriraja and New Hampshire respectively. Similarly, Ramappa and Loknath (1985) reported 2.4 FCR value for Giriraja in India. The variation might be due to the duration of experimentation (0-150 days). Variations on the Efficacy of Probiotics in Poultry 213 the diet of animals and have not found differences among the treatments in relation to body weight gain, feed conversion rate and carcass yield.

Egg production

Similarly, egg production and egg qualities were also observed for 150-180 days revealed different results.

Trends of production

The general growth trend for egg production for the given period of experimentation(5-8 months) have been illustrated by the **Table 5**.

Table 5. ANOVA table for egg production.

Treatment	Mean±SE(6 months)	Mean±SE(7 months)	Mean±SE(8 months)
1	15.50 ± 0.64	15.50 ± 0.64	17.25 ± 0.85
2	15.25 ± 0.47	15.25 ± 0.47	16.25 ± 0.47
3	14.75± 1.25	14.75 ±1.25	15.75 ± 1.25
4	16.50 ± 0.64	16.50 ± 0.64	17.50 ± 0.64
5	15.00 ± 1.22	15.00 ± 1.22	16.00 ± 1.22
6	16.00 ± 0.70	16.00 ± 0.70	17.00 ± 0.70
7	16.75 ±1.10	16.75 ± 1.10	17.75 ± 1.10
8	16.25 ± 0.85	16.25 ± 0.85	17.25 ± 0.85
P value	0.710	0.718	0.718
Level of significance	NS	NS	NS

The pattern shows that there is general increasing trend from 5 to 8 month. No significant difference was observed ($P<0.05$) till the period of experimentation. However, the lowest production was recorded during 5th month followed by increasing trend. The highest mean production was recorded from T8 (Giriraja-15 ml) and T4 (Sakini- 15 ml) probiotic. However, the lowest production was recorded during 6th month followed by increasing trend. The highest mean production was recorded from T8 (Giriraja-15 ml) and T4 (Sakini- 15 ml) probiotic. The findings disagree the findings of different researchers as Mulder et al. (1997) reported that inoculation with a probiotic strain of *L. reuteri* significantly increased the number of eggs

in layer chickens. A similar finding was presented by Ln et al. (2003) with a mixture of *L. acidophilus/gallinarum*, *Lactobacillus agilis*, *L. salivarius*, and *Lactobacillus* spp. The exact reason for the variation could not be explored however results of research available in literature with the use of probiotics are very variable, once several factors can interfere such as type of probiotic, its action mode, its interaction with the host and breeding environment.

Egg quality parameters

The eggs from different groups were evaluated for egg internal quality using proximate analysis and the data have been illustrated by the table below.

Table 6. ANOVA Table for egg quality parameters

Treatment	Total eggs set	Fertility	Fertility %	Hatchability	Hatchability %
T1	28	18	64.88	15	53
T2	37	29	78	25	67
T3	57	52	91	20	35
T4	53	36	67	27	50
T5	51	44	86	33	64
T6	51	46	90	41	80
T7	54	49	90	27	47
T8	64	52	81	30	46

The fertility and hatchability have been presented in terms of percentage. There is variation in the result, however the result of T6 Bios-a- 10 ml seems better than other groups. The exact reason could not be explored however breed effect might be the reason.

Nutrient content of Egg

Study on nutrient content of egg was done with proximate analysis using standard protocol. The results have been given as under table.

Table 7..ANOVA table for Study on Nutrient content of Egg

Treatment	FDM (mean±SE)	OM (mean±SE)	T.Ash (mean±SE)	CP (mean±SE)	CF (mean±SE)	EE (mean±SE)
T1	5.5700 ±.48951 ^c	98.8050± .11722 ^c	1.1950± .11722 ^a	22.9675± .96100 ^a	4.6775± .58036 ^{ab}	2.9800± .12430 ^a
T2	14.0125± .25753 ^{ab}	98.8500± .11262 ^c	1.1500 ± .11262 ^a	24.6675± 1.20384 ^a	5.1525± .44541 ^{bc}	3.2775± .18377 ^{ab}
T3	13.3575 ± .37292 ^a	98.9175± .09205 ^c	1.0825± .09205 ^a	25.7200± .44913 ^a	5.2650± .46638 ^{bc}	3.1875± .24787 ^a
T4	14.8350± .60753 ^{bc}	98.4400± .04243 ^{ab}	1.5600± .04243	25.7150± .58121 ^b	4.2225± .45983 ^{ab}	3.8325± .20064 ^{bc}
T5	13.9125± .25591 ^{ab}	98.7600± .08765 ^c	1.1450± .10186 ^a	26.3650± .44636 ^a	3.9375± .12990 ^a	3.7675± .15750 ^{bc}
T6	13.9500± .20244 ^{ab}	98.6700± .04882 ^{bc}	1.3275± .04854 ^{ab}	26.4150± .27810 ^{ab}	3.9700± .20166 ^{ab}	3.8675± .13536 ^{bc}
T7	13.6000± .23491 ^a	98.8900± .07506 ^c	1.1375± .09366 ^a	24.9075± .55868 ^a	4.0150± .22292 ^{ab}	3.4650± .08026 ^{ab}
T8	13.6975± .21065 ^{ab}	98.2975± .13714 ^a	1.5325± .15184	26.8500± .86270 ^b	3.6825± .12632 ^a	3.4675± .08901 ^{ab}
P value	0.004	0.001	0.011	0.022	0.038	0.00
Level of Significance	**	**	**	**	**	**

Note: SE= Standard Error, **= Significant at 0.5% level, *= Significant at 0.1% level

Results from this study revealed that there is significant difference (P<0.05) for different nutritional traits. The effect of treatment seems to increase the nutrient content in both the breeds.(FDM, OM, CP, Cf and EE).

The findings agrees with that of Mulder et al.(1997) as he reported that inoculation with a probiotic strain of *L. reuteri* significantly increased the number and quality of eggs in layer chickens. A similar finding was presented by Lnetal. (2003) with a mixture of *L.acidophilus/gallinarum*, *Lactobacillusagilis*, *Ls alivarius*, and *Lactobacillus* spp.

Conclusion

The feed intake, weight gain, Feed conversion ratio(FCR)& egg quality on 10-15ml /kg feed probiotic supplemented group found to be significantly superior in Giriraja and Sakinibreed of chicken. Similarly,significantly increased the number and quality of eggs on both the breeds. So, Present study revealed that Giriraja and Sakini breeds have potential effect on supplementation of Probiotic on feed. Giriraja breed showed better performance than Sakini in terms of higher growth, better feed efficiency and saving per birds.

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