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Effect of Soluble Probiotic on Production Performance of Akar Putra Chicken

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Abstract: The present study was conducted to investigate the effect of soluble probiotic on the production parameters of local Malaysian chicken (Akar Putra). A total of seventy two 1-day-old Akar Putra chicks were randomly assigned to three treatment groups, each having 3 replicates of 8 chicks. The treatments were as follows: (T1) control, (T2) probiotic supplemented at 1 g/liter tap water, (T3) probiotic supplemented at 2 g/liter tap water. The results revealed that supplementation of soluble probiotic at both the rates resulted in an improved performance of male and female Akar putra chicken. Birds who received 2 g of prepared probiotic per liter of water (T3) exhibited highly improved ($p<0.05$) body weight, weight gain and feed conversion ratio than other groups. It can be concluded that supplementation of prepared soluble probiotic would be economically beneficial in improving the production performance and health status of Akar Putra chicken.

Key words: Akar Putra chicken, soluble probiotic, production performance, drinking water

INTRODUCTION

The use of antimicrobial growth promoters (AGP) in animal nutrition had been beneficial for the improvement of growth performance and prevention of diseases (Barton, 2000; Snel *et al*., 2002). Since there are increasing public concerns regarding antibiotic resistance, other alternatives like probiotics are in vogue. Probiotics are live, non-pathogenic bacteria that contribute to the health and balance of the intestinal tract (Mojgani *et al*., 2007).

Inclusion of probiotics in poultry diet improved broiler performance (Manafi, 2015), increased egg production in layers, enhanced fertility and hatchability in broiler breeders (Zanqana, 2007). Probiotics are classified as GRAS (Generally Recognized as Safe) by Food and Drug Administration (FDA). The concept of their use relates to maintaining the equilibrium of the intestinal microflora by the addition of beneficial microorganisms (Goldin, 1998). Many studies have reported the benefits of probiotics utilization on productive indexes (Jin *et al*., 1998; Taherpour *et al*., 2012), however, Barrow (1992) found no beneficial effects. The major probiotic strains include *Lactobacillus*, *Saccharomyces*, *Streptococcus* and *Aspergillus*. Presently, *Bacillus*, *Lactobacillus* and *Saccharomyces* are the major strains used in broilers (Chen *et al*., 2009).

Since there have been few investigations based on the inclusion levels of probiotic in drinking water, therefore The present study was conducted with the aim to assess the efficacy of prepared soluble probiotic on the production performance parameters of a local Malaysian chicken (Akar Putra).

MATERIALS AND METHODS

Animals and housing: The present study was conducted in the poultry farm of Veterinary Medicine Faculty, University of Putra Malaysia (UPM) from 15th December 2014 to 15th March 2015. This study consisted of 72 1-day-old local Malaysian chicks (Akar Putra Strain). The birds were randomly assigned to three treatment groups, each having 3 replicates of 8 chicks. The birds were housed in wire cages with eight birds (4 males and 4 females) per pen (5 x 4 x 1.5). The basal feed (Table 1) and water were offered *ad libitum*. All the birds were kept under uniform management conditions throughout the experimental period of 12 weeks.

Probiotic composition and treatments: According to the manufacturer information label, prepared probiotic (PP) contained three useful bacteria (*Lactobacillus acidophilus*, *Bacillus subtilis*, *Bifidobacterium*) and yeast (*Saccharomyces cervisia*) in quantities mentioned in Table 2. The treatments were as follows: (T1) control, (T2) probiotic supplemented at 1 g/liter tap water, (T3) probiotic supplemented at 2 g/liter tap water.

Sampling procedure: Body weight, weight gain, feed intake and feed conversion ratio (g of feed/g of weight

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gain) of male and female chicken were recorded separately from week 1 until 12 weeks of age. Final growth rate was calculated at the marketing age as per the formula of Brody (1945). In the same regard, the variation ratio of production performance parameters was recorded based on the formula mentioned by Jawad *et al.* (2015).

Statistical analysis: The data obtained were analyzed by one-way analysis of variance (ANOVA). The means were compared by Least Significant Difference and Duncan's multiple range tests and differences were considered significant at $p<0.05$ and $p<0.01$.

RESULTS AND DISCUSSION

The results revealed that using 1 and 2 g of prepared probiotic (PP) in the daily drinking water of Akar putra chicken had dose dependent effects on the evaluated characteristics. The positive effects of probiotics in Akar Putra chicken have also been reported by other workers using *Lactobacillus acidophilus*, *Bacillus subtilis*, *Bifidobacterium* and *Saccharomyces cervisia* with dry fermented feed (Lokman *et al.*, 2015) and wet fermented feed (Jawad *et al.*, 2016).

Table 3 and 4 shows effect of using soluble probiotic on weekly body weight of Akar putra male and female chicken. At the end of experiment, 1 g of PP caused 4.27 and 22.04% and 2 g of PP 41.97 and 39.779% improvement in male and female body weights, respectively compared to the control group. Table 5 and 6 reveals that the superiority in the weight gain for T2 and T3 compared to the control group. Thus, the higher growth rates were achieved in T3, followed by T2 and T1. The results were consistent with the results of Wysong (2003) who reported that the natural feed additives such as probiotic are very important tools that can improve daily weight gain, feed efficiency utilization and productive performance. However, Fethiere and Miles (1987), Sato *et al.* (2002), Ahmad (2004), Yousefi and Karkoodi (2007) did not find any effect on the production performance by dietary supplementation of probiotic and yeast.

Interestingly, 1 g prepared probiotic impacted positively the total feed intake of males but showed negative effect on total feed consumption of females. However, the opposite trend was observed with the use of 2 g probiotic (Table 7 and 8). Lokman *et al.* (2015) however reported that use of fermented probiotic in chicken diet did not cause significant variation in the total feed intake compared with the control group. In the present study, there was significant improvement in terms of reduction in the feed conversion ratio (FCR) of male and female Akar putra chicken supplemented with probiotics compared to the control group (Table 9 and 10). Feed conversion value was higher ($p<0.01$) in the control group compared to the probiotic treatments in the

Table 1: Composition of basal diet

	Basal diet	
Ingredients	1 to 22 d	23 to 84 d
Corn	44.9	53.1
Wheat	18.0	15
Soybean meal (45%)	33	27
Mineral and vitamin premix	1	1
Oil	2	3
Limestone	0.8	0.6
Dicalcium phosphate	0.3	0.3
Total	100%	100%
Calculated analysis*		
Crude protein (%)	21.92	19.70
Metabolism energy (kcal per kg diet)	2990	3100
Calcium (%)	0.93	0.85
Phosphorus (%)	0.48	0.45
Methionine (%)	0.55	0.50
Lysine (%)	1.35	1.25
Methionine+Cysteine (%)	0.85	0.91
Folic acid (%)	1.1	1.2

*Calculated analysis according to NRC (1977)

Table 2: Microbial composition of prepared probiotic

Type of organism	Total count/g product
Lactobacillus acidophilus	10^9
Bacillus subtilis	10^9
Bifidobacterium	10^9
Saccharomyces cervisia	10^8

Table 3: Effect of soluble probiotic on mean weekly body weight (g) of male Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	61.333±2.333	64±3.215	61.333±2.728
2	104.333±3.18^b	125±2.082^a	128.333±2.333^a
3	148.333±2.728^b	209±3.215^a	208.667±2.963^a
4	274±4.583^b	309.668±5.044^a	314.664±5.812^a
5	343.667±10.414^b	443±9.866^a	440±10.693^a
6	498.667±14.146^c	599.667±13.296^b	679.333±12.197^a
7	608.667±8.686^c	765.333±8.413^b	874.333±9.244^a
8	868.333±10.975^b	1069±9.866^a	1039±9.074^a
9	1035.667±13.544^b	1135.667±12.811^a	1180±13.796^a
10	1162.333±16.796^c	1246.333±15.983^b	1401±15.716^a
11	1288.667±19.064^b	1322.667±18.224^b	1649.333±19.633^a
12	1389.667±20.497^b	1449±19.925^b	1973±19.079^a
GR	190.631±0.302^c	191.63±0.198^b	193.946±0.094^a

Mean values with common superscript in row differ significantly ($p<0.01$). GR: Growth rate

Table 4: Effect of soluble probiotic on mean weekly body weight (g) of female Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	61.667±3.756	64.333±3.48	62.5±3.617
2	104.2±3.062^b	125.667±2.603^a	128.833±2.744^a
3	178.3±4.304^b	209.667±3.756^a	209±3.215^a
4	276.667±6.642^b	311±6.083^a	314.667±5.812^a
5	343.667±10.414^b	444±10.693^a	439.333±10.138^a
6	468.333±13.86	479±13.577	485.667±13.296
7	516.733±9.585^b	595±8.963^a	611.333±9.244^a
8	624.267±11.779^b	708.667±10.414^a	715.333±10.975^a
9	713.333±16.476^b	801±17.039^a	799±16.197^a
10	814.667±17.91^b	919±18.193^a	973±17.349^a
11	876±19.348^c	1023.333±18.782^b	1135.667±19.064^a
12	936±19.079^c	1142.333±18.523^b	1308.333±17.704^a
GR	186.135±0.538^b	189.336±0.423^a	190.608±0.43^a

Mean values with common superscript in row differ significantly ($p<0.01$). Mean values at week 9 differ significantly ($p<0.05$). GR: Growth rate

Table 5: Effect of soluble probiotic on weekly weight gain of male Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	28±1.732	33±1.732	31±1.733
2	43±1^{c}	61±1.155^{b}	67±0.577^{a}
3	44±1.155^{c}	84±1.155^{a}	80.333±0.667^{b}
4	125.667±1.856^{a}	100.667±1.54^{b}	106±2.887^{b}
5	69.667±6.119^{b}	133.333±4.91^{a}	125.333±4.93^{a}
6	155±3.786^{b}	156.667±3.48^{b}	239.333±1.667^{a}
7	110±5.508^{c}	165.667±4.91^{b}	195±3.055^{a}
8	259.667±2.333^{b}	303.667±1.453^{a}	164.667±1.202^{c}
9	167.333±3.283^{a}	66.667±3.383^{c}	141±4.726^{b}
10	126.667±3.712^{b}	110.667±3.722^{c}	221±2.082^{a}
11	126.333±2.404^{b}	76.333±2.4^{c}	248.333±4.372^{a}
12	101±1.528^{c}	126.333±1.856^{b}	323.667±0.882^{a}
Total	113.028±1.54^{b}	118.167±1.516^{b}	161.889±1.66^{a}

Mean values with common superscript in row differ significantly (p<0.01)

Table 6: Effect of soluble probiotic on weekly weight gain of female Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	28±1.732	33±1.731	31±1.73
2	42.533±0.472^{c}	61.333±0.882^{b}	66.333±0.882^{a}
3	74.1±1.242^{c}	84±1.155^{a}	80.167±0.601^{b}
4	98.367±2.36	101.333±2.333	105.667±2.603
5	67±3.786^{b}	133±4.619^{a}	124.667±4.333^{a}
6	124.667±3.48^{a}	35±2.887^{c}	46.333±3.18^{b}
7	48.4±4.277^{b}	116±4.619^{a}	125.667±4.055^{a}
8	107.533±2.21^{ab}	113.667±1.453^{a}	104±1.732^{b}
9	89.067±4.775	92.333±6.642	83.667±5.239
10	101.333±1.453^{c}	118±1.155^{b}	174±1.155^{a}
11	61.333±1.453^{c}	104.333±0.667^{b}	162.667±1.764^{a}
12	60±0.577^{c}	119±0.577^{b}	172.667±1.856^{a}
Total	75.195±1.421^{c}	92.583±1.398^{b}	106.403±1.318^{a}

Mean values with common superscript in row differ significantly (p<0.01). Mean values at week 8 differ significantly (p<0.05)

Table 7: Effect of soluble probiotic on weekly feed consumption (g) of male Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	43.667±3.756	47.667±2.963	51±3.215
2	81±2.082^{c}	119.167±2.205^{b}	133.933±2.034^{a}
3	125.667±6.642^{b}	157.333±6.36^{a}	152.333±5.548^{a}
4	195.667±4.91^{c}	259.667±4.096^{a}	226.333±4.631^{b}
5	268.333±5.548^{a}	257±5.292^{ab}	240.333±5.548^{b}
6	268.667±9.528^{b}	203.333±9.244^{c}	397±8.963^{a}
7	406.667±11.26^{b}	341±10.693^{c}	448.333±10.138^{a}
8	409.667±12.991^{b}	457±11.59^{a}	463.333±11.05^{a}
9	498.667±10.99^{b}	261±10.44^{c}	540.667±10.171^{a}
10	439.333±13.86^{b}	365.333±13.017^{c}	508.5±13.156^{a}
11	533±15.308^{b}	280±14.468^{c}	600.333±13.92^{a}
12	505.667±14.449^{b}	338±13.892^{c}	609±14.731^{a}
Total	3776±104.147^{b}	3086.5±103.001^{c}	4371.1±111.231^{a}

Mean values with common superscript in row differ significantly (p<0.01). Mean values at weeks 3 and 8 differ significantly (p<0.05)

Table 8: Effect of soluble probiotic on weekly feed consumption (g) of female Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	44.1±4.128	48.333±3.48	52.167±4.187
2	82.3±3.15^{c}	120.167±3.032^{b}	134.833±2.744^{a}
3	125.333±6.36^{b}	157.667±6.642^{a}	153±6.083^{a}
4	195.667±4.91^{c}	260±4.359^{a}	226.333±4.631^{b}
5	230.333±6.36^{b}	257.667±5.812^{a}	240.333±5.548^{ab}
6	276.333±9.244^{a}	207.667±8.686^{b}	127.333±8.413^{c}
7	248.433±11.06^{b}	332±9.866^{a}	197.333±10.138^{c}
8	289.4±12.763^{a}	239.667±12.143^{b}	199.667±11.319^{b}
9	265.333±10.713^{b}	475±10.44^{a}	202±11.269^{c}
10	357.367±13.889^{b}	438.333±13.017^{a}	281±12.741^{c}
11	260±15.308^{b}	448±14.468^{a}	196.333±13.92^{c}
12	307.333±14.17^{a}	248.667±14.449^{b}	198.333±14.17^{c}
Total	2681.933±112.021^{b}	3233.167±106.347^{a}	2208.667±105.107^{c}

Mean values with common superscript in row differ significantly (p<0.01). Mean values at weeks 3 and 5 differ significantly (p<0.05)

Table 9: Effect of soluble probiotic on weekly feed conversion ratio (g feed/g gain) of male Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	1.555±0.039^{a}	1.443±0.025^{b}	1.644±0.02^{a}
2	1.884±0.035	1.956±0.073	2±0.044
3	2.864±0.204^{a}	1.872±0.05^{b}	1.895±0.055^{b}
4	1.557±0.019^{c}	2.58±0.011^{a}	2.136±0.015^{b}
5	3.897±0.257^{a}	1.93±0.033^{b}	1.92±0.032^{b}
6	1.732±0.021^{a}	1.297±0.031^{b}	1.658±0.025^{a}
7	3.726±0.292^{a}	2.066±0.126^{b}	2.302±0.087^{b}
8	1.577±0.036^{b}	1.505±0.031^{b}	2.814±0.073^{a}
9	2.98±0.044^{b}	3.922±0.109^{a}	3.838±0.059^{a}
10	3.468±0.043^{a}	3.301±0.051^{b}	2.3±0.039^{c}
11	4.218±0.052^{a}	3.664±0.093^{b}	2.417±0.028^{c}
12	5.005±0.079^{a}	2.674±0.077^{b}	1.882±0.049^{c}
Total	33.393±0.545^{a}	26.106±0.386^{b}	26.993±0.496^{b}

Mean values with common superscript in row differ significantly (p<0.01)

Table 10: Effect of soluble probiotic on weekly feed conversion ratio (g feed/g gain) of female Akar Putra chicken

	Treatments		
Week	T1	T2	T3
1	1.569±0.051^{ab}	1.462±0.031^{b}	1.678±0.041^{a}
2	1.938±0.105	1.961±0.077	2.034±0.068
3	1.689±0.058	1.876±0.053	1.908±0.066
4	1.989±0.005^{c}	2.567±0.016^{a}	2.142±0.009^{b}
5	3.449±0.104^{a}	1.939±0.024^{b}	1.929±0.023^{b}
6	2.216±0.016^{c}	5.974±0.245^{a}	2.749±0.028^{b}
7	5.255±0.693^{a}	2.878±0.199^{b}	1.579±0.131^{b}
8	2.689±0.065^{a}	2.106±0.08^{b}	1.917±0.078^{b}
9	2.984±0.046^{b}	5.182±0.26^{a}	2.417±0.022^{c}
10	3.524±0.087^{a}	3.713±0.074^{a}	1.614±0.063^{b}
11	4.232±0.152^{a}	4.293±0.115^{a}	1.205±0.073^{b}
12	5.125±0.264^{a}	2.09±0.127^{b}	1.15±0.092^{c}
Total	35.636±0.819^{a}	34.903±0.624^{a}	20.739±0.733^{b}

Mean values with common superscript in row differ significantly (p<0.01). Mean values at week 1 differ significantly (p<0.05)

periods from 14 to 21, 28 to 49 and 63 to 84 days of age in males. While in females, it was higher in the periods from 28 to 35, 42 to 56 and 63 to 84 days of age. The results are in agreement with the finding of other workers who reported improvement in the FCR of broilers and turkeys fed *Lactobacillus* sp. and *Saccharomyces cerevisiae* based probiotics in the diet (Jin *et al*., 1998; Besnard *et al*., 2000; Ahmad, 2004; Ayanwale *et al*., 2006; Yousefi and Karkoodi, 2007; Lokman *et al*., 2015). The positive effect on the growth performance and FCR as a result of probiotics could be attributed to the retention of beneficial microbial population in the digestive tract and improving feed digestion and absorption (Fuller, 1989). However, Ergun

et al. (2000) and Mutus *et al.* (2006) did not find any influence of probiotics on feed conversion ratio. The reason for the variable effect of biological additives may be confounded by variations in gut flora and environmental conditions (Mahdavi *et al.*, 2005). Some researchers reported that when chicks were housed in a clean environment, a probiotic was unaffectivein terms of improving the performance (Anderson *et al.*, 1999).

Conclusion: In conclusion, using 1 and 2 g of soluble probiotic in drinking water caused a significant improvement in the production performance of Akar Putra chicken. They supposedly exert beneficial effect via retention of beneficial microbial population in the digestive tract; improving feed digestion and absorption, thus could be used as a viable tool in improving the health status and production of Akar putra chicken.

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