PERFORMANCE OF FREE-RANGE BROILER CHICKENS UNDER DIFFERENT RESTRICTED FEEDING REGIMENS

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ABSTRACT

Ninety 5-week-old free-range broiler chickens were raised for six weeks to investigate the growth performance in response to different restricted feeding regimens. The birds were randomly distributed to three treatment groups: Treatment 1 - three times a day; Treatment 2 - fed twice a day; and Treatment 3 - fed once a day. Each treatment group was replicated three times with ten birds per replication. Production parameters and dressing recovery were measured and subjected to analysis of variance in a completely randomized design. The average final weight and gain in weight of broilers in Treatment 1 were higher than the other two treatments (P<0.01). Feed consumption and feed efficiency were higher in Treatment 1 compared to the other treatments (P<0.05). The dressing percentage with and without giblets did not differ significantly among the three treatment groups (P>0.05). No mortality was observed in all treatment groups. Birds fed thrice a day (Treatment 1) showed the highest income over feed cost, followed by Treatment 2. The results suggest that higher production and income in free-range broiler chickens can be achieved by feeding thrice a day, compared to twice a day or once a day feeding.

Keywords: broiler, feeding regimen, free-range chicken, production

INTRODUCTION

In the past, broiler production in the Philippines has been observed to be very lucrative. Presently, however, the profitability of the poultry enterprise is under question because of rising cost of feeds leading to higher cost of production. Furthermore, the introduction of free-range chicken in the market had aggravated the problem on production cost due to higher feed consumption as a result of longer feeding period, However, the higher cost is compensated because free-range chicken is priced relatively higher and consumers are willing to pay a higher price for free-range chicken. The popularity of free-range chicken is due to consumers' perception that the meat of free-range chickens is healthier than that of birds kept in poultry house (Fanatico *et al.*, 2009).

Under natural condition, free-range chicken eats a variety of mixed foods such as insects, fruits, worms, forages and seeds. With this scavenging activity of chicken, there is a need to explore feeding strategies on how to reduce cost of

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production. One strategy is to design a feeding regimen or feeding management system for free-range chicken that encourage them to graze and scavenge foods that should produce organic chicken with maximum lean body mass, highest feed conversion ratio and maximum body weight.

Tumova *et al*. (2002) stated that nutrient restriction program is one of the management tools in reducing cost of production as well as in solving problems related to increased body fat deposition, high mortality, metabolic disorders and incidence of skeletal diseases. Feed restriction is a process of denying fast growing birds full access to nutrients that are required for their normal growth and development (Fanooc and Torki, 2010). This could be done by reducing the actual volume of feeds offered or by reducing nutrient density or diet dilution given to broilers. Limiting feed intake depresses growth during the period of feed restriction (Gavaerts *et al*., 2000). Prolonged feed restriction depresses growth and diminishes the potential of compensatory growth (Gonzales *et al*., 1998) and the relative weight of breast muscles (Acar *et al*., 1995).

Comparison of restricted feeding management systems can help determine the effectiveness of strategies for commercial broiler chickens raised under free-range or organic production systems. The feeding trial was conducted to evaluate the growth performance of free-range broiler chickens in response to different restricted feeding regimens.

MATERIALS AND METHODS

Ninety 5-week-old broiler chickens were distributed to three treatments following a completely randomized design. There were three replications for every treatment with 10 broilers per replicate. The birds were subjected to three feeding regimens/management practices described as follows: Treatment 1 – thrice a day feeding at 6-7 AM, 11-12 AM, and 4-5 PM; Treatment 2 – twice a day feeding at 6-7 AM and 4-5 PM; and Treatment 3 – once a day feeding at 11:00 AM to 1:00 PM. The feeds were offered using circular type automatic feeder.

The broiler chickens were raised under free-range system. Portable pens were provided with a divisional fence made up of plastic netted screen to protect them from predators and to avoid mixing of birds with other experimental units/ group. Each bird was allotted 6 m^2 of pasture with a total area of 540 m^2. The broiler chickens were fed with a standard corn-soybean diet formulated to meet nutrient requirements of broiler finisher ration. The composition and calculated nutrient analysis of the corn-soybean meal based diet are presented in Table 1. The birds were subjected to similar management practices throughout the duration of the study, except duration of feeding.

The performance of the broiler chickens in the different treatment groups were evaluated based on average weekly body weight, gain in weight, feed consumption, feed conversion efficiency, dressing recovery, livability and grazing behavior. The income over feed cost and broiler chicken cost analysis were estimated to determine economic profitability. All data gathered were subjected to analysis of variance following a completely randomized design. Comparison of treatment means was done using least significant difference.

Table 1. Composition and calculated nutrient analysis of basal diets (as fed basis) fed to free-range broiler chickens.

Composition	Parts (%)
Corn	67.00
Soybean oil meal	27.90
Fish meal	2.00
Dicalcium phosphate	1.38
Limestone	0.62
Salt	0.50
Mineral/vitamin premix[1]	0.50
Total	100.00
Calculated analysis	
Crude Protein (%)	18.70
Metabolizable energy (Kcal)	2,944.00
Calcium (%)	0.78
Available phosphorous (%)	0.39
Methionine (%)	0.33
Lysine (%)	0.90

[1]Each 4.54 kg. of Vitamin/Mineral premix contains: 5,000,000 IU Vit. A, 998,800 IU Vit.D, 3,000 IU Vit. E, 1,500 mg Vit. B_1, 4,500 mg Vit. B_2, 1,000 mg Vit. B_6, 13,000 mcg Vit. B_{12}, 30,000 mcg Niacin, 6,000 calcium panthothenate, 100 mg folic acid, 300 mcg biotin, 40,000 ferrous sulfate, 1,500 mg potassium iodide, 400 mg cobalt sulfate, 90,000 mg magnesium sulfate, 4,000 mg copper sulfate, 40,000 mg zinc sulfate, 50,000 mg manganese sulfate, 25,000 mg lysine and 28,000 mg methionine.

RESULTS AND DISCUSSION

Body weight and body weight gain

The initial body weight and body weight (Table 2) at first week of the study did not significantly ($P>0.05$) differ among treatments. However, starting on the second week of the study, significant difference ($P<0.05$) on body weight were observed among the treatments. Treatment 1 demonstrated superiority over the other treatment groups one week after the regimented feeding was applied. This implies that underfeeding took place subsequently with the application of different feeding regimen, in agreement with the observations made by Fanooci and Torki (2010), Zubair and Leeson (1996) and Acar *et al*. (1995) that feed restriction decreases body weight of birds.

During the third week up to the fifth week of the study, significant differences ($P<0.01$) on the weekly body weight of the birds were observed. Birds in Treatment 1 performed better than the those in Treatments 2 and 3. The higher body weight of birds in Treatment 1 was attributed mainly to the frequency of feeding and

Table 2. Average weekly body weight (g) of free-range broiler chickens under different restricted feeding regimens.

Week	Treatments (frequency of feeding)			C.V(%)
	1 (thrice a day)	2 (twice a day)	3 (once a day)	
Initial	1509.17	1474.00	1483.05	0.09
1st	1631.94	1503.33	1529.44	5.13
2nd *	1753.05[a]	1558.89[b]	1578.89[b]	3.76
3rd **	1855.00[a]	1601.11[b]	1613.33[b]	3.93
4th **	1994.70[a]	1704.44[b]	1696.11[b]	3.81
5th**	2208.59[a]	1870.11[b]	1821.11[b]	5.54
6th**	2338.17[a]	2015.17[b]	1926.83[b]	4.40

Means in the same row with different superscripts differ (P<0.05)*, (P<0.01)**.

availability of nutrients for growing birds from morning to afternoon. This suggests that the application of restricted feeding regimens to broilers depresses growth as Gavaerts *et al.* (2000) have similarly observed.

The weekly body weight gain of free-range broiler chickens is presented in Table 3. On the first three weeks of the study, significant differences (P<0.01) on weight gains were observed among the treatments. Broiler chickens in Treatments 2 and 3 had lower weight gain compared to Treatment 1 (P<0.01). This can be attributed to the limited access to nutrients required for growth in Treatments 2 and 3 compared to Treatment 1. However, on the fifth and sixth weeks of the study, no significant difference among the treatments was observed (P>0.05). This suggests that the effect of regimented feeding after three weeks diminishes; probably, the broiler chickens have already adapted to the natural environment in the pasture area. It is interesting to note that the average weekly weight gain of those broiler chickens that have lesser feeding time per day (Treatments 2 and 3) gradually accelerated their growth towards the end of the study. Whereas, broiler chickens with greater access to feed nutrient (Treatment 1) had almost the same average weekly weight gain throughout the feeding period. The result of this study is in partial agreement with the findings of Gonzales *et al*. (1998) that prolonged feed restriction depresses growth and diminishes the potential for compensatory growth.

Feed consumption and feed efficiency

Table 4 presents the feed consumption of broiler chickens under different restricted feeding regimens. During the first four weeks of feeding, the broiler chickens consumed almost the same amount of feeds and did not significantly differ (P>0.05) in terms of volume intake. However, on the last week of feeding period, significant difference (P<0.05) was noted on feed consumption among the different treatments. Likewise, the cumulative feed consumption of the broiler chickens differ significantly (P<0.05) as affected by the different feeding regimens. Broiler chickens in Treatment 1 consumed significantly (P<0.05) more feeds than those birds in Treatments 2 and 3.

Table 3. Average weekly weight gain (g) of free-range broiler chickens under different restricted feeding regimens.

Week	Treatments (frequency of feeding)			C.V(%)
	1 (thrice a day)	2 (twice a day)	3 (once a day)	
1st **	122.77[a]	33.33[b]	46.39[b]	18.08
2nd**	121.11[a]	55.56[b]	49.45[b]	15.69
3rd **	101.95[a]	42.22[b]	34.44[b]	30.58
4th *	139.70[a]	103.33[b]	82.78[b]	14.86
5th	213.89	165.67	125.00	36.06
6th	129.58	145.06	105.72	18.11
Total gain in weight**	829.00[a]	541.17[b]	443.78[b]	0.13

Means in the same row with different superscripts differ (P<0.05)*, (P<0.01)**.

Similarly, the feed efficiency and feed conversion ratio (Table 5) varied (P<0.05) among treatments. Broiler chickens in Treatment 1 appeared to be superior and efficient (P<0.05) in converting feed than those in Treatments 2 and 3. The differences in feed efficiency could be attributed to variation in body weight gain and in the amount of feed consumed as Lambio *et al*. (2001) have similarly observed. Moreover, the volume of feeds as well as length of feeding time per day applied to broiler chicken in Treatment 1 resulted to higher weight gain because of the greater proportion of nutrients used for growth/production. This suggests that feed restriction regimen in broiler chicken reduces feed efficiencies or feed conversion ratio. A very low feed efficiency result was obtained because the first five weeks of growing was not considered and birds tend to eat more and growth rate is expected to be slower onwards to maturity.

Livability

There was no mortality observed in all the treatments throughout the duration of the study. Therefore, the feeding regimen applied to broiler chicken raised in pasture had no adverse effect in terms of livability. The result indicated that there is a bright prospect for broiler chicken to be raised commercially under free-range system. However, free-range broiler chickens exhibit different mortality trends during the growing period depending on management and environmental conditions.

Broiler behavior

During the first week of the study, the broiler chickens appeared to be very nervous and fearful when they were let loose in the pasture. They huddled together around the portable pens and seldom scavenged on the soil. During feeding time, broiler chickens in Treatments 2 and 3 were observed to be restless and some

Table 4. Average total and weekly feed consumption (g) of free-range broiler chickens under different restricted feeding regimens.

Week	Treatments (frequency of feeding)			C.V.
	1 (thrice a day)	2 (twice a day)	3 (once a day)	
1st	491.67	436.11	355.56	16.79
2nd	497.22	444.45	362.50	14.22
3rd	506.94	451.39	375.00	13.62
4th	529.17	466.67	384.72	12.51
5th	736.11	641.67	558.33	14.74
6th*	880.56[a]	776.39[b]	723.62[b]	5.27
Total feed consumption*	3641.67[a]	3216.68[b]	2759.72[b]	0.06

Means in the same row with different superscripts differ (P<0.05)*, (P<0.01)**.

Table 5. Average feed efficiency and feed conversion ratio of free-range broiler chickens under different restricted feeding regimens.

Parameters	Treatments (frequency of feeding)			C.V.
	1 (thrice a day)	2 (twice a day)	3 (once a day)	
Feed efficiency, %*	25.81[a]	17.13[b]	16.28[b]	0.20
Feed conversion ratio*	4.40[a]	5.86[a]	6.17[b]	14.18

Means in the same row with different superscripts differ (P<0.05)*, (P<0.01)**.

showed unruliness as they compete for feeds, an indication of underfeeding. On the other hand, broiler chickens in Treatment 1 showed normal behavior although somewhat excited at the time feeds were offered. Birds on this group had longer feeding times as compared to other treatments which resulted to higher feed consumption.

As time passed, the broiler chickens became more active and started to move freely and browsed on the herbage and forages. They chased insects and scratched on the soil to look for food. Broiler chickens in Treatments 2 and 3 were observed to be more aggressive and excited in scratching and grazing as compared to those in Treatment 1. Broiler chickens in Treatment 3 were observed to be more frequent in grazing and stayed longer in the pasture to look for food.

Dressing recovery

The dressing percentage with and without giblets is presented in Table 6. Results showed that the application of different restricted feeding regimens did not affect the dressing recovery of broiler chicken with and without giblets (P>0.05). This observation is contrary to the findings of Flores (1998), Bustria (2000), Gomez (2001) and Ramos as cited by Dagaas and Bermas (2010).

Table 6. Average dressing recovery of free-range broiler chickens under different restricted feeding regimens.

Parameters	Treatments (frequency of feeding)			C.V.
	1 (thrice a day)	2 (twice a day)	3 (once a day)	
Dressing % with giblets	75.77	77.87	75.87	3.53
Dressing % without giblets	67.83	69.63	70.23	0.80

Economic analysis

The income over feed cost and broiler cost analysis for free range chickens under different restricted feeding regiments is shown in Table 7. Among the different treatment groups, Treatment 1 obtained the highest income with an average of PhP 50.76 per head followed by Treatment 3 with an average of PhP 29.99 and the lowest was Treatment 2 with an average of PhP 17.75.

Table 7. Income over feed and chicken cost (PhP) of free-range broiler chickens under different restricted feeding regimens.

Item	Treatments (frequency of feeding)		
	1 (thrice a day)	2 (twice a day)	3 (once a day)
Cost			
Cost/kg feed	20.07	20.07	20.07
Total cost/treatment	2,193.36	1,936.80	1,111.67
Total cost/chicken	73.09	64.56	37.05
Sales			
Cost/kg chicken	150.00	150.00	150.00
Total sales	3,715.50	2,469.30	2,011.32
Total sales/chicken	123.85	82.31	67.04
Income/chicken	50.76	17.75	29.99

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