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Growth Performance of Philippine Native Chicken Fed Diet Supplemented with Varying Levels of Madre de Agua (*Trichanthera gigantea* Nees) Leaf Meal

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ABSTRACT

This study aimed to assess the effects of different levels of *Trichanthera gigantea* leaf meal (TGLM) supplementation on the growth performance of Philippine Native chickens fed commercial chicken grower ration. A total of 96 three-month old native chickens of two sexes were randomly distributed to the four treatments with 3 replicates and 4 chickens per replicate in a 2 x 4 factorial in Completely Randomized Design (CRD). Under semi-confinement system, the dietary treatments consisted of 0, 5, 10, and 15% levels of TGLM supplementation for 13 weeks. Results revealed that cumulative voluntary feed intake (VFI) increased as TGLM supplementation increased, and was significantly highest with 15% level at weeks 10, 11 and 12. Although differences were not significant except at weeks 4 and 7, there was a decreasing trend in cumulative weight gain (CWG) with increasing TGLM level. Average daily gain (ADG) was not significantly affected by varying levels of TGLM supplementation, and feed conversion efficiency (FCE) showed a decreasing trend as TGLM level increased and was only significantly low ($p<0.01$) with 15% level at week 7. Comparing between sexes, the males were significantly higher than females in all production performance parameters. Therefore, TGLM is palatable but not adequate enough to supply the nutrients needed for a comparable weight gain with that of 0% supplementation, and a 5-10% inclusion in the diet is recommended.

Keywords: Growth, forage leafmeal, native chicken, supplementation

INTRODUCTION

Native chicken production plays an important socio-economic role in developing countries as they remain to be the most dominant avian species raised despite the introduction of exotic strains (FAO, 2004). They are important source of animal protein and are normally reared by smallholder farmers with meager resources because they are hardy, adapt well to rural environments, survive on little inputs, and adjust to fluctuations in feed availability (Goromela *et al.,* 2008). They are usually reared under free range (Mekria and Gezahegn, 2010) or extensive

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use. Hence, it becomes imperative among smallholder farmers to adopt a feeding strategy that is convenient and less expensive for their free-ranging native chicken. With the current interest of poultry consumers on organic animal products, attention is now directed on the use of plant forages as supplement to scavenging poultry (Branckaert and Gueye, 1999). With great potential is the leaf meal of *Trichanthera gigantea* or "madre de agua". It is a non-legume species which adapts well to humid-tropical conditions that is well-accepted by a range of domestic animals after a period of familiarization (Rosales, 1997). It is known to contain soluble carbohydrates, with protein ranging from 17 to 22% on DM basis, most of which are true protein with good amino acid balance (Rosales, 1997; Hess and Dominguez, 1998). The plant contains low level of anti-nutritional factors (Rosales, 1997) and the leaves are highly palatable to animals. However, there is a dearth of information on the level of supplementation in native chickens, hence, this study.

This study aimed to assess the potential of *Trichanthera gigantea* leaf meal on promoting growth of native chickens, and determine the optimum level of *Trichanthera gigantea* leaf meal supplementation for native chickens.

MATERIALS AND METHODS

Preparation of the Supplement

The fresh mature leaves of *T. gigantea* were sundried to about 10-14% moisture in elevated plastic mesh, turning the leaves occasionally for uniform dryness. The dried leaves were then hammer-milled through 2-mm sieve. After which, samples of the leaf meal and the commercial grower ration were subjected to laboratory analysis using standard methods (AOAC, 1995).

Care and Management of Experimental Birds

A total of 96 three-month old native chickens were used. A one-week period was observed for adaptation to the new environment, and the recommended management practices were properly implemented to all experimental birds. The experimental site was properly lighted at night to stimulate feed consumption, and fenced to prevent predation and entry of non-experimental animals and persons.

Upon arrival of the birds, commercial grower ration was given *ad libitum* for two weeks. On the third week, the birds were gradually shifted to the dietary treatments fed twice daily at 7:00 AM and 4:00 PM at 90 g per bird/day with access to fresh and clean drinking water. Proper health program and sanitation practices, including bio-security measures for the experimental birds were strictly implemented by a field veterinarian.

Experimental Treatments and Design

Ninety-six birds, 48 males and 48 females, were randomly distributed to the different treatments. The 24 cages were designed to have a loafing area and equipped with water and feed troughs. The *Trichanthera gigantea* leaf meal (TGLM) was mixed with the commercial grower ration in the following levels: T_0 = 0%

(control); $T_1 = 5\%$; $T_2 = 10\%$; and $T_3 = 15\%$, replicated 3 times, and the experiment was laid out in 2x4 factorial in completely randomized design (CRD).

Data Gathered and Analysis

1. Cumulative Voluntary Feed Intake (CVFI) – This was calculated as:

$$\text{CVFI, g} = \frac{\text{Total Feed Given - Feed Refused}}{\text{Number of Birds}}$$

2. Cumulative Weight Gain (CWG) - the CWG of the birds was calculated as:

$$\text{CWG, g} = \text{BWi} - \text{BWo}$$

where: BWi = body weight of birds at ith period of measurement
BWo = initial body weight

3. Average Daily Gain (ADG), g – This was computed using the formula:

$$\text{ADG} = \frac{\text{Final live weight - Initial Weight}}{\text{Feeding days}}$$

4. Feed Conversion Efficiency (FCE) - This was calculated as:

$$\text{FCE} = \frac{\text{CVFI}}{\text{BWi - BWo}}$$

where: CVFI = the cumulative voluntary feed intake of birds
BWi = body weight of ith period of measurement
BWo = initial body weight

Data collected were subjected to one-way ANOVA using SPSS version 17. Post hoc analysis using DMRT was employed to compare treatment means.

RESULTS AND DISCUSSION

Cumulative Voluntary Feed Intake

As presented in Table 1 and Figure 1, there were no significant differences in the voluntary feed intake among treatments observed, except in the later stages of the growing period (at weeks 10, 11, and 12), showing highest intake levels in T3 group (15% TGLM) and lowest in T0 (control, without TGLM). This result showed that TGLM is palatable, and increasing levels did cause reduction in voluntary intake. This is supported by Rosales (1997), saying that *Trichanthera gigantea* forage is highly palatable to animals. It could also be due to its bulky character with rather lower nutrient concentration per unit weight, thus birds eat more to satisfy their needs (Adeyemi, *et al.,* 2012).

Nutrient requirements of chickens were also influenced by genotype and body size. In terms of sex, male chickens showed significantly higher voluntary feed intake compared to females throughout the growing period (Table 1 and Figure 2).

The higher intake levels of male birds could be attributed to their large body size and superior muscling, and large-sized birds tend to require more dietary nutrients than their small- sized counterparts (Magala *et al.,* 2012).

Cumulative Weight Gain

The cumulative weekly weight gain (CWG) of the birds revealed no significant effects of the varying levels of TGLM supplementation except in weeks 4 and 7 (Table 2 and Figure 3). However, the pattern of differences showed a generally decreasing trend in CWG with increasing level of TGLM supplementation. Growing birds have a definite limit for protein accretion, and this ability is mainly governed by genotype (Legates and Everett, 1990; Samadi, 2006). Acar *et al.* (1993) observed that slow-growing chicken strains have lower muscular DNA concentration than their fast- growing counterparts, which explains the slow-response of native chicken genotype. It appeared that nutrient density of TGLM is incomparable to the commercial grower ration even with increasing VFI as TGLM level increases. Looking at differences between male and female birds, Table 2 and Figure 4 showed significantly higher (P>0.01) CWG of males than females which could be attributed to sexual dimorphism that resulted to male chickens growing faster than females and as a consequence of their higher voluntary intake levels.

Table 1. Cumulative voluntary feed intake (g) of male and female native chickens fed diet supplemented with varying levels of *T. gigantea* leaf meal.

Sex	Week												
	1	2	3	4	5	6	7	8	9	10	11	12	13
F	428[b]	380[b]	399[b]	432[b]	432[b]	404[b]	418[b]	480	479	489[b]	519[b]	520[b]	507[b]
M	472[a]	444[a]	468[a]	499[a]	553[a]	517[a]	489[a]	517	516	551[a]	554[a]	571[a]	593[a]
p-value	*0.017*	*0.035*	*0.006*	*0.006*	*0.000*	*0.001*	*0.027*	*0.228*	*0.152*	*0.005*	*0.019*	0.001	0.000
Treatments													
T_0 – 0%	482	394	437	429	457	428	405	445	462	469[b]	501[b]	504[b]	515
T_1 – 5%	452	437	446	458	475	456	439	505	497	506[ab]	529[ab]	546[ab]	552
T_2 – 10%	428	406	434	510	550	489	477	507	494	533[ab]	557[a]	554[ab]	547
T_3 – 15%	437	410	416	465	487	470	493	537	536	574[a]	558[a]	579[a]	588
p-value	*0.156*	*0.748*	*0.801*	*0.099*	*0.061*	*0.437*	*0.183*	*0.215*	*0.239*	*0.011*	*0.022*	0.005	0.074

Column means with no common letter-superscript are significantly different.

Average Daily Gain

The average daily gain (ADG) was not significantly affected by the different levels of TGLM, showing a similar pattern of differences than that of the CWG (Table 3 and Figure 5). However, the results suggested that up to 10% TGLM level of incorporation could be better than higher levels. Comparing between sexes, ADG was significantly greater (P<0.01) in males than in females, due to sexual dimorphism and as a consequence of higher voluntary feed intake. This finding is supported by Ndegwa *et al.* (2012) who said that cockerels generally grow faster than pullets and show a better response to high dietary protein levels.

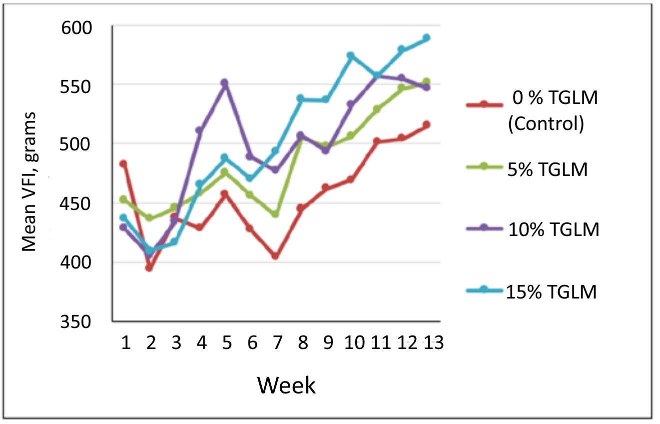

Figure 1. Cumulative voluntary feed intake (g) of native chicken varying levels of *T. gigantea* leaf meal across sexes.

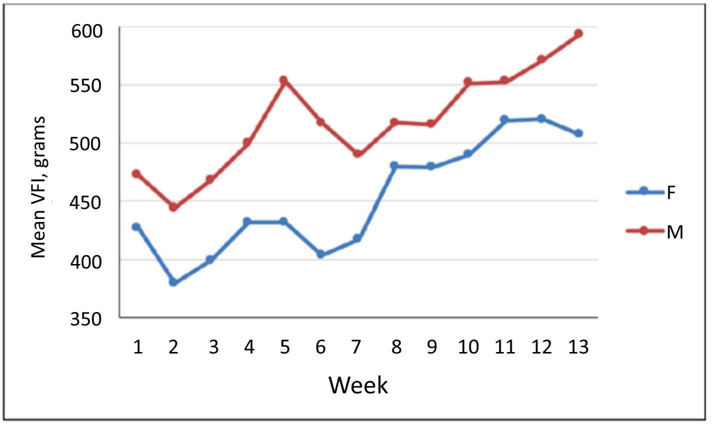

Figure 2. Cumulative voluntary feed intake (g) of female and male native chicken across levels of *T. gigantea* leaf meal supplementation.

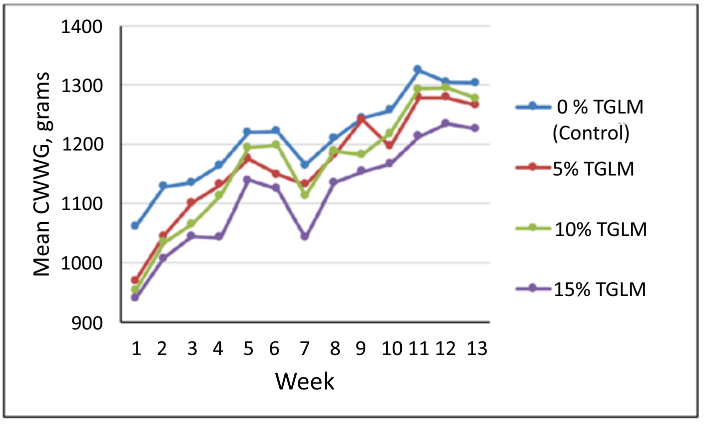

Figure 3. Cumulative weekly weight gain (g) of native chickens fed diets supplemented with *Trichanthera gigantea* leaf meal across sexes.

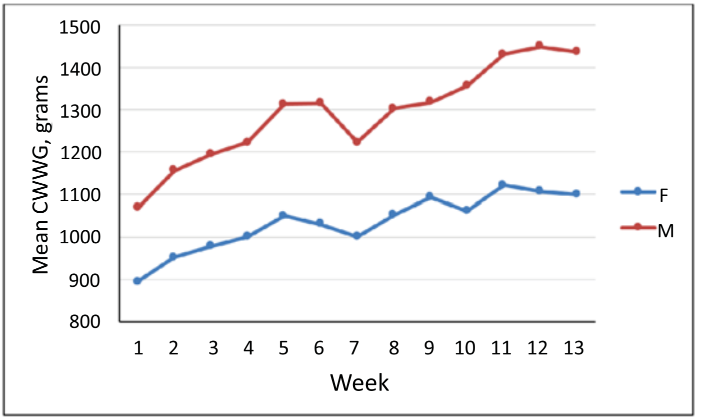

Figure 4. Cumulative weekly weight gain (g) of female and male native chickens across different levels of Trichanthera gigantea leaf meal supplementation.

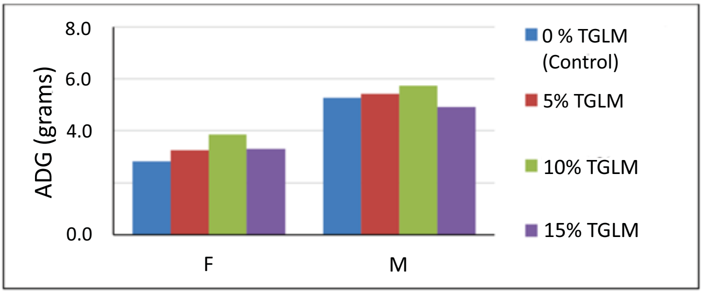

Figure 5. Average daily gain (g) of male and female native chickens fed diet supplemented with varying levels of *T. gigantea* leaf meal.

Table 2. Cumulative weight gain (g) of male and female native chickens fed diet supplemented with varying levels of *T. gigantea* leaf meal.

Sex	Week												
	1	2	3	4	5	6	7	8	9	10	11	12	13
F	895^{b}	952^{b}	978^{b}	1001^{b}	1051^{b}	1030^{b}	1001^{b}	1053^{b}	1093^{b}	1062^{b}	1122^{b}	1106^{b}	1099^{b}
M	1068^{a}	1156^{a}	1194^{a}	1224^{a}	1313^{a}	1316^{a}	1224^{a}	1303^{a}	1317^{a}	1356^{a}	1431^{a}	1449^{a}	1437^{a}
p-value	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Treatments													
0%	1061	1128	1134	1165^{a}	1220	1221	1165^{a}	1209	1244	1256	1323	1304	1303
5%	971	1046	1100	1131^{ab}	1175	1149	1131^{ab}	1181	1242	1195	1278	1278	1266
10%	954	1034	1066	1112^{ab}	1194	1198	1112^{ab}	1188	1182	1218	1293	1295	1277
15%	940	1008	1045	1042^{b}	1139	1124	1042^{b}	1134	1153	1167	1212	1234	1225
p-value	*0.054*	*0.062*	*0.174*	*0.012*	*0.363*	*0.172*	*0.012*	*0.544*	*0.373*	*0.188*	*0.102*	*0.331*	*0.426*

Column means with no common letter-superscript are significantly different.

Table 3. Average daily gain (ADG) of male and female native chickens fed diet supplemented with varying levels of *T. gigantea* leaf meal.

Factors		ADG (g)
Sex	Female	3[b]
	Male	5[a]
	p- value	*0.000*
Treatments	T_0 - 0% TGLM (Control)	4
	T_1 - 5% TGLM	4
	T_2 - 10% TGL	5
	T_3 - 15% TGLM	4
	p-value	*0.613*

Column means with no common letter-superscripts within a factor are significantly different.

Feed Conversion Efficiency

Feed conversion efficiency (FCE) is "feed per gain" ratio, measured in terms of the amount of feed required to produce a unit of weight gain, so that the smaller the value the more efficient it is (Bestil, 2001). Results revealed no significant differences among treatments except in week 7 where increasing level of TGLM in the diet lowers the FCE of birds. It should be noted that as birds grow older, they become more efficient in utilizing feed containing TGLM (Table 4 and Figure 6), and males were significantly more efficient than females at weeks 10 to 13 (Table 4 and Figure 7).

Table 4. Feed conversion efficiency (FCE) of male and female native chickens fed diets supplemented with varying levels of *T. gigantea* leaf meal.

	Week												
Sex	1	2	3	4	5	6	7	8	9	10	11	12	13
F	5.13	2.67	2.36	2.32	1.76	2.25	2.29	2.28	1.79	2.11[b]	1.73[b]	1.78[b]	1.80[b]
M	4.77	2.38	2.01	1.92	1.63	1.50	1.89	1.66	1.56	1.45[a]	1.22[a]	1.19[a]	1.29[a]
p-value	*0.653*	*0.343*	*0.109*	*0.075*	*0.432*	*0.086*	*0.032*	*0.168*	*0.369*	*0.030*	*0.012*	*0.000*	*0.009*
Treatments													
0%	4.29	2.40	2.31	1.96	1.74	2.01	1.82[a]	2.05	1.75	1.86	1.57	1.56	1.60
5%	5.68	2.63	2.05	1.86	1.64	2.05	1.75[a]	2.06	1.47	1.78	1.41	1.49	1.55
10%	4.34	2.25	2.09	2.01	1.64	1.39	1.86[a]	1.52	1.52	1.48	1.31	1.28	1.35
15%	5.50	2.81	2.29	2.66	1.76	2.04	2.93[b]	2.26	1.98	1.98	1.61	1.61	1.69
p-value	*0.470*	*0.566*	*0.724*	*0.060*	*0.930*	*0.614*	*0.000*	*0.657*	*0.460*	*0.628*	*0.599*	*0.324*	*0.575*

Column means with no common letter-superscript are significantly different.

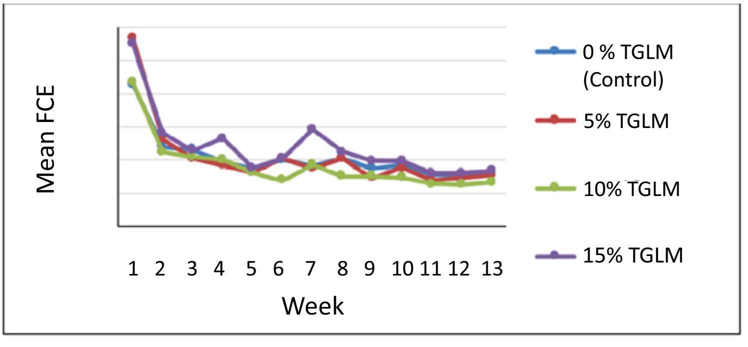

Figure 6. Feed conversion efficiency (FCE) of native chickens fed diet supplemented with varying levels of *T. gigantea* leaf meal across sexes.

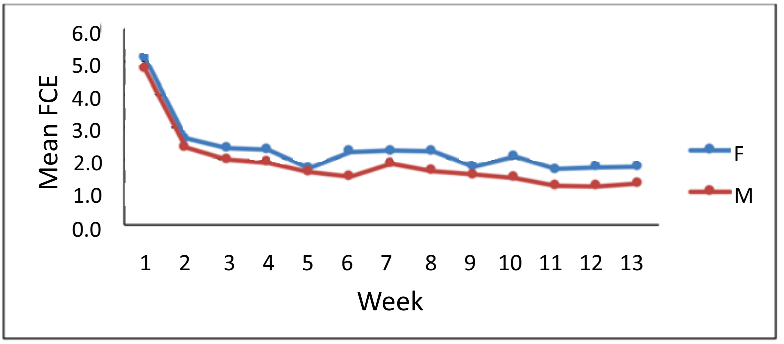

Figure 7. Feed conversion efficiency (FCE) of female and male native chicken across varying levels of *T. gigantea* leaf meal supplementation.

CONCLUSION

The inclusion of *T. gigantea* leaf meal in the chicken grower ration has great potential in terms of voluntary feed intake and feed conversion efficiency, and does not significantly reduce weight gain. Its nutrient density was not enough to support higher weight gains, so that levels up to 10% in the grower ration can be adopted. Thus, its inclusion in chicken grower rations could be practically adopted for a cost-effective feeding of native chickens.

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