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Edible meat yield and carcass characteristics of Gramasree cockerels on diet containing different levels of protein and energy

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Abstract
Two hundred- and eighty-eight-day-old Gramasree male chicks were assigned to six dietary treatments in a 3x2 factorial arrangement with three protein levels (22, 20 and 18% CP) and two energy levels (3100 and 2800 kcal ME/ kg) and reared from 0-12 weeks of age at University Poultry and Duck Farm (UPDF), Mannuthy, Thrissur, Kerala. At the end of 8, 10, 12 weeks of age, two birds from each replicate, totaling 48 birds were randomly selected and slaughtered humanely and the processing yields and losses were estimated. Energy level at 3100 kcal ME/ kg led to significant (p<0.05) increase in percent ready-to-cook yield at 8 weeks of age. The mean percent abdominal fat was significantly (p<0.01) higher in birds fed with 3100 kcal ME/ kg at all ages of slaughter. Birds fed with diet containing 3100 kcal ME/ kg led to reduction in processing losses at all ages of slaughter in all treatment groups. In general, among the dietary treatment groups birds fed with diet containing 3100 kcal ME/ kg at 22 and 20% CP had better growth and higher percent ready-to-cook yield and eviscerated yield and lower processing losses at all slaughter ages.

Keywords: Gramasree, cockerel, ready-to-cook yield, eviscerated yield

1. Introduction
Gramasree is a synthetic dual purpose coloured breed of chicken developed at University Poultry and Duck Farm (UPDF), Mannuthy. It was evolved in the year 2005 for backyard purpose. It is having the germplasm of indigenous Naked Neck, New Hampshire, Plymouth Rock and Rhode Island Red breeds of chicken. Gramasree has inherited the innate disease resistant characteristics of indigenous chicken and the genetic potential for high egg production and fast growth of exotic chicken. Gramasree cockerel rearing is gaining much popularity among the poultry farmers of Kerala due to consumer's preference for the gamey flavor of its meat and the resemblance of these cockerels to that of desi chicken. Utilization of these male chicks through small holder farming helps to increase the chicken meat production of the state and also generate employment to the rural community. Strategic advantages of cockerel rearing are lower chick price, more viability, less initial investment, consumer's preference, better market price, disease resistance, family labour utilization and easy management. At present there is no available scientific information regarding the nutrient requirement of Gramasree cockerels for meat purpose so the farmers are giving high protein and high energy diets like broiler starter for first two months of age and broiler finisher thereafter. The birds are grown for 2½ to 3 months of age and sold for meat when they reach around 2 kg body weight. It leads to wastage of protein and energy which are highly expensive and increase the cost of production. The present study is aimed at establishing the dietary energy to protein ration to optimize the growth, feed conversion ratio and carcass characteristics of Gramasree cockerels reared in closed confinement.

2. Materials and Methods
Two hundred- and eighty-eight-day-old Gramasree male chicks belonging to a single hatch were procured from University Poultry and Duck Farm, Mannuthy and utilized for this study. All chicks were weighed individually, wing banded and randomly assigned to six dietary treatment groups having 4 replicates of 12 birds each. The dietary treatments were in a factorial arrangement with 3 levels of protein (22, 20 and 18% CP) and 2 energy levels (3100 and 2800 kcal ME/kg diet). The dietary treatments were T_1-Ration containing 22% CP and 3100 kcal ME/kg, T_2-Ration containing 20% CP and 3100 kcal ME/kg, T_3-Ration containing18% CP and 3100 kcal ME/kg, T4-Ration containing 22% CP and 2800 kcal

ME/kg, T_5- Ration containing 20% CP and 2800 kcal ME/ kg and T_6-Ration containing 18% CP and 2800 kcal ME/ kg. The percent composition of feed ingredients of six experimental rations was presented in Table: 1. All chicks were reared under uniform conditions of management under deep litter system. Feed and water were provided *ad libitum* from 0-12 weeks of age. Body weight of birds at fortnightly intervals and feed consumed by each replicate were recorded fortnightly interval. At the end of 8, 10, 12 weeks of age, two birds from each replicate, totaling 48 birds were randomly selected and slaughtered humanely and the processing yields and losses were estimated as per the procedure described by Indian Standard Institution (I.S.I, 1973) [1]. The observations recorded were eviscerated yield, ready-to-cook yield, giblet yield, abdominal fat and total losses. Data collected on various parameters analyzed statistically using 3x2 factorial design as described by Snedecor and Cochran (1994) and significant differences were spotted by applying Duncan's Multiple Range Test (Duncan, 1955) [2]. All statistical analysis was done by using the software SPSS version 21.

Table 1: Percent composition of feed ingredients of six experimental ration

SL. No.	Ingredients	% composition of different experimental diet					
		T_1	T_2	T_3	T_4	T_5	T_6
1	Yellow Maize	53.40	57.00	63.18	57.50	64.17	67.00
2	De-oiled soybean meal	31.75	27.80	23.00	31.25	27.07	25.00
3	Unsalted dried fish	8.00	8.00	6.00	8.00	6.00	4.00
4	Rice bran oil	5.00	5.00	5.00	0.50	0.50	0.50
5	Dicalcium phosphate	1.30	1.45	1.57	2.00	1.50	1.75
6	Calcite	0.30	0.50	1.00	0.50	0.50	1.50
7	Salt	0.25	0.25	0.25	0.25	0.25	0.25
	Total	100	100	100	100	100	100
Feed Supplements (g/100kg feed)							
1	L-Lysine[1]	0.25	0.39	0.50	0.30	0.41	0.50
2	DL-Methionine[2]	0.40	0.42	0.45	0.43	0.43	0.47
3	Zagromix[3]	25	25	25	25	25	25
4	Choline chloride[4]	100	100	100	100	100	100
5	Supplimin-TM[5]	100	100	100	100	100	100
6	Toxin binder[6]	100	100	100	100	100	100
7	Tefroli plus[7]	30	30	30	30	30	30
8	Coxistac*120[8]	50	50	50	50	50	50

1. L-Lysine Monohydrochloride 98.5% (Promois)
2. DL-Methionine 99% (Promois: Feed grade)
3. Zagromix LR-859, Content per kg- Vit A 50 MIU, Vit D_3 14 MIU, Vit C 20 MIU, Vit K 6g, Vit B_1 4g, VitB_2 24g, Vit B_6 4g, Vit B_{12} 23mg, Biotin 50 mg, Folic acid 5.6g, Nicotinic acid 28g (Zagro Singapore Pvt. Ltd.)
4. Choline chloride 60% (Corn cob N. B Group Company Ltd.)
5. Supplimin-TM -manganese sulphate equivalent to elemental manganese 54g, zine sulphate equivalent to elemental Zinc 52g, ferrous sulphate equivalent to elemental iron 30g, copper sulphate equivalent to elemental copper 4g, potassium iodide equivalent to elemental iodine 1g, cobalt sulphate equivalent to elemental cobalt 0.1g, chromium chloride equivalent to elemental chromium 0.2g, Selenomethionine 100ppm (Shree Pharma Mehsana, India)
6. UTTP- 5 powder contains treated aluminosilicates, propionates, formates and acetates (Bio-Tech, Bangalore)
7. Tefroli Plus powder (TTK Health care Ltd.)
8. Coxistac*120, each kg contains 120g salinomycin sodium (Vitec Nutrition Ltd.)

3. Results and Discussion

The mean body weight of birds in different dietary treatment combinations at 8th, 10th and 12th week of age was given in Table: 2. Body weight of birds fed with diet containing 20% CP and 2800 kcal ME/ kg (T_5) and 22% CP and 3100 kcal ME/ kg (T_1) were significantly (p<0.01) higher compared to other treatment groups 8th, 10th, and 12th week of age. This result was in agreement with the findings of (Ndegwa *et al*., 2001) [3]. This result revealed that although birds of T_5 were fed with diet containing medium protein and low energy diet, by taking more feed the birds had compensated its nutrient requirement and grown well compare to high energy high protein diets, this leads to poor FCR. The individual effect of different levels of protein and energy on mean percent processing yields and losses at 8th, 10th and 12th week of age was presented in the tables 3, 4 and 5 respectively. The results revealed that the different levels of protein had no significant effect on mean percent processing yields and losses at 8th, 10th, and 12th week slaughter. This result was in agreement with the findings of (Roy *et al*., 2010) [4] and (Magala *et al*., 2012) [5]. At 8th week slaughter, the mean percent giblet yield and abdominal fat was significantly (p<0.01) higher in birds fed with 3100 kcal ME/ kg when compared to diet containing 2800 kcal ME/ kg. The mean percent total losses were significantly (p<0.05) lower and mean percent ready-to-cook yield were significantly (p<0.05) higher in birds fed with 3100 kcal ME/ kg at 8th week. This result was in agreement with the findings of (Vashan *et al*., 2010) [6]. At 8th, 10th and 12th week slaughter, the mean percent abdominal fat was significantly (p<0.01) higher in birds fed with diet containing 3100 kcal ME/ kg. Such findings have also been documented earlier in Vanaraja chicken by (Ram Rao *et al*., 2005) [7], who reported that high-energy diet tend to produce more abdominal fat. Birds fed with low energy diet showed numerically higher processing losses at 10th and 12th week of age. Considering different slaughter ages, the percent ready-to-cook yield and eviscerated yield were lower at 8th week slaughter and higher at 10th and 12th week slaughter. The processing losses were higher at 8th week slaughter and lower at 10th and 12th week slaughter among all treatment groups. This result suggests that better growth and processing yield could be obtained from 10th week onwards on diet containing 3100 kcal ME/ kg at 22 or 20% CP.

Table 2: Mean (±SE) body weight of birds in different dietary treatment combinations, g

Treatments	Age in weeks		
	8	10	12
T_1	826.88^{a}±18.10	1124.79^{a}±17.93	1451.95^{ab}±25.68
T_2	741.42^{c}±5.25	1042.60^{b}±11.23	1404.19^{b}±8.14
T_3	629.98^{d}±22.25	898.63^{c}±5.06	1296.63^{d}±14.64
T_4	801.61^{ab}±3.75	1137.78^{a}±15.75	1379.72^{c}±12.14
T_5	813.45^{ab}±8.16	1160.02^{a}±16.86	1499.61^{a}±15.00
T_6	767.75^{bc}±19.99	925.22^{c}±24.57	1195.11^{c}±38.67

Means bearing one common superscript do not differ significantly within a column (p<0.01)

Table 3: Effect of different levels of protein and energy on mean (±SE) percent processing yields and losses of at 8 weeks of age

CP (%)	Parameters (%)				
	Eviscerated yield	Reay-to-cook yield	Total losses	Abdominal fat	Giblet yield
22	59.39±1.89	65.54±1.97	34.46±1.97	0.83±0.17	5.32±0.09
20	54.68±1.83	61.14±2.08	38.86±2.08	0.76±0.19	5.70±0.22
18	54.18±2.18	60.51±2.28	39.49±2.28	0.88±0.22	5.45±0.33
F-value	2.021^{ns}	1.802^{ns}	0.299^{ns}	0.299^{ns}	1.228^{ns}
p-value	0.162	0.193	0.745	0.745	0.316
Energy (kcal ME/kg)	**Eviscerated yield**	**Reay-to-cook yield**	**Total losses**	**Abdominal fat**	**Giblet yield**
3100	57.76±1.14	64.91±1.14	35.09±1.14	1.28±0.83	5.87±0.17
2800	54.42±2.03	59.89±2.04	40.11±2.04	3.36±0.06	5.11±0.14
f-value	2.033^{ns}	4.431*	4.53*	70.894**	14.194**
p-value	0.171	0.04	0.04	0.001	0.001

** Highly significant (p<0.01) *Significant (p<0.05) ns= non-significant

Table 4: Effect of different levels of protein and energy on mean (±SE) percent processing yields and losses of at 10th week of age

CP (%)	Parameters (%)				
	Eviscerated yield	Reay-to-cook yield	Total losses	Abdominal fat	Giblet yield
22	63.67±1.09	71.12±1.23	28.88±0.97	1.97±0.17	5.48±0.08
20	61.66±1.33	67.71±2.58	32.29±2.98	0.96±0.13	5.09±0.22
18	60.68±3.02	66.35±1.28	33.65±2.28	0.78±0.01	4.89±0.23
f-value	1.046^{ns}	0.711^{ns}	0.711^{ns}	21.075^{ns}	0.992^{ns}
p-value	0.372	0.099	0.099	0.504	0.288
Energy (kcal ME/ kg)	**Eviscerated yield**	**Reay-to-cook yield**	**Total losses**	**Abdominal fat**	**Giblet yield**
3100	62.90±1.34	69.13±1.10	30.87±1.13	1.22±0.84	5.01±0.14
2800	61.66±1.03	67.66±2.14	32.34±2.14	0.82±0.16	5.18±0.16
f-value	0.011^{ns}	0.711^{ns}	21.075^{ns}	0.992**	0.711^{ns}
p-value	0.918	0.410	0.410	0.001	0.332

** Highly significant (p<.01) ns= non-significant

Table 5: Effect of different levels of protein and energy on mean (±SE) percent processing yields and losses of at 12th week of age

CP (%)	Parameters (%)				
	Eviscerated yield	Reay-to-cook yield	Total losses	Abdominal fat	Giblet yield
22	66.11±2.17	73.06±2.19	26.94±2.19	1.81±0.33	5.14±0.16
20	64.01±1.49	70.55±1.60	29.45±1.59	1.56±0.32	4.98±0.18
18	62.31±1.36	68.31±1.29	31.69±1.23	1.00±0.13	5.00±0.10
f-value	1.087^{ns}	1.802^{ns}	1.802^{ns}	4.216^{ns}	0.210^{ns}
p-value	0.358	0.192	0.192	0.072	0.813
Energy (kcal ME/ kg)	**Eviscerated yield**	**Reay-to-cook yield**	**Total losses**	**Abdominal fat**	**Giblet yield**
3100	63.53±1.52	70.54±1.60	29.46±1.60	1.64±0.26	5.07±0.15
2800	64.76±1.32	70.66±1.39	29.34±1.30	0.97±0.09	4.93±0.14
f-value	0.340^{ns}	0.000^{ns}	0.000^{ns}	17.374**	3.135^{ns}
p-value	0.567	0.985	0.410	0.001	0.901

** Highly significant (p<0.01) ns= non-significant

4. Conclusion

This result suggests that, among the dietary treatment groups birds fed with diet containing 3100 kcal ME/ kg at 22 and 20% CP had better growth and higher percent ready-to-cook yield and eviscerated yield and lower processing losses at all slaughter ages.

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