PROTEIN AND ENERGY REQUIREMENTS OF IMPROVED NATIVE CHICKEN (CHAITANYA) FOR OPTIMUM GROWTH PERFORMANCE AND ECONOMIZATION OF DIET FOR MEAT PURPOSE

THESIS

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In partial fulfillment of the requirements for the Degree of

MASTER OF VETERINARY SCIENCE

IN

POULTRY SCIENCE

BY

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I hereby declare that the experimental research work and interpretation of the thesis entitled **"PROTEIN AND ENERGY REQUIREMENTS OF IMPROVED NATIVE CHICKEN (CHAITANYA) FOR OPTIMUM GROWTH PERFORMANCE AND ECONOMIZATION OF DIET FOR MEAT PURPOSE"** or part thereof has not been submitted for any other degree or diploma of any University, nor the data have been derived from any thesis/publication of any University or scientific organization. The sources of materials used and all assistance received during the course of investigation have been duly acknowledged.

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This is to certify that the thesis entitled, **"PROTEIN AND ENERGY REQUIREMENTS OF IMPROVED NATIVE CHICKEN (CHAITANYA) FOR OPTIMUM GROWTH PERFORMANCE AND ECONOMIZATION OF DIET FOR MEAT PURPOSE"** submitted by **VHANALE RUSHIKESH DATTATRAYA** to the Maharashtra Animal and Fishery Sciences University in partial fulfillment of the requirement for the degree of **MASTER OF VETERINARY SCIENCE** has been approved by the Student's Advisory Committee after examination in collaboration with the External Examiner.

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ABBREVIATIONS

Abbreviations		Full Form
₹	:	Rupees
%	:	Per cent
&	:	And
/	:	Per
:	:	Ratio
@	:	At the rate of
+	:	Plus
<	:	Less Than
>	:	More Than
±	:	Plus minus
°C	:	Degree Celsius
AHD	:	Animal husbandry department
ANOVA	:	Analysis of Variance
AOAC	:	Association of Official Analytic Chemist
BIS	:	Beaureu of Indian standard
BMD	:	Bacitracin methylene disalicytate
BW	:	Body Weight
BWG	:	Body Weight Gain
CARI	:	Central avian research institute
CF	:	Crude fibre
CFCR	:	Cumulative feed conversion ratio
CP	:	Crude protein
CPDO	:	Central poultry development organization

CRBD	:	Complete randomized block design
D/d	:	Day
DCP	:	Di calcium Phosphate
DM	:	Dry matter
DOC	:	De-oiled cake
DORB	:	De-oiled rice bran
E:P	:	Energy protein ratio
EE	:	Ether extract
et al.	:	Ethically all (Et alia- and other)
FAOSTAT	:	Food and agriculture organization statistics
FCR	:	Feed conversion ratio
FCR	:	Feed Conversion Ratio
FI	:	Feed intake
Fig.	:	Figure
g/b	:	Gram per bird
g/d	:	Gram Per Day
G/g	:	Gram
GDP	:	Gross domestic products
GOI	:	Government of India
HA	:	Haemagglutination
HED	:	High energy density
HI	:	Haemagglutination inhibition
HND	:	High nutrient density
HPD	:	High protein density
i.e.	:	That is

IBD	:	Infectious bursal disease
ICAR	:	Indian Council of Agriculture Research
ISSN	:	International standard serial number
Kcal	:	Kilocalories
Kg	:	Kilogram
L/l	:	Liter
LBW	:	Live body weight
LED	:	Low energy density
LND	:	Low nutrient density
LPD	:	Low protein density
LSP	:	Lime stone powder
MCP	:	Monocalcium phosphate
ME	:	Metabolizable energy
MED	:	Moderate energy density
mg	:	Milli Gram
mg/dl	:	Milli gram per deci litre
MJ	:	Milli joule
Ml	:	Milli liter
MND	:	Moderate nutrient density
MPD	:	Moderate protein density
MUFA	:	Monounsaturated fatty acids
NCD	:	New Castle Disease
NCDV	:	New Castles Disease Virus
ng/ml	:	Nano gram per milli litre
No.	:	Number

NS	:	Non-Significant
OIE	:	World organization for animal health
P<0.01	:	Significant At 1% Level
P<0.05	:	Significant At 5% Level
PBS	:	Phosphate buffer saline
PUFA	:	Polyunsaturated fatty acid
P-value	:	Probability value
RD	:	Ranikhet disease
SEM	:	Standard error for mean
SFA	:	Saturated fatty acids
TA	:	Total ash
viz.	:	Videlict namely
VLED	:	Very low energy density

INTRODUCTION

India is the third largest egg producer and fifth largest chicken meat producer in the world. The total Poultry population in the country is 851.81 Million in 2019, increased by 16.8% over previous Census out of which backyard poultry contributes 317.07 Million (Dept. of AHD 20th Livestock Census). About 95.22 billion of eggs are produced with 8% annual growth rate and 4.8 million tons of poultry meat is produced with 7% growth rate per annum in India (Dept. of AHD Annual report 2019-20). Today, poultry industry is worth of about 1.25 lac crore rupees and providing employment to more than 4 million people either directly or indirectly. Poultry Industry is contributing about ₹ 70,000/- crore to the national GDP. Poultry meat in the past had been considered to be a delicacy but as a result of increasing levels of urbanization and higher levels of disposable incomes, poultry meat is increasingly seen as less of a luxury product and more as a daily staple. Further with changing food habits and increasing exposure to global recipes, the orthodox Indian population is increasingly converting to a non-vegetarian diet. Poultry meat is preferred over other meat products as it is considered more hygienic and is available throughout the year across the country at relatively lesser prices than fish/mutton/chevon. Apart from broiler meat, the demand of native or native cross bird is tremendously increased, because of its taste, tender meat, and delicious eggs. During corona period the native cross birds were having good demand and market price was better than broiler birds. Day by day the native cross birds are becoming more popular due to its special capabilities such as adaptability to local environment, resistance to certain diseases, self propagation, meat qualities and many other specific criteria.

Recently due to the high demand of eggs or meat of native birds, colour feathered birds are being raised on a commercial scale to gain more meat or eggs. The business of native cross birds is becoming more and more popular as the eggs and meat of these cross birds is getting appreciable value in the market. These birds are

routinely demanded at dhabas and hotels and as well in wholesale or retail markets. Kaveri, Satpuda, DP, Sonali, Nati etc are the few examples of native cross birds (improved native chicken) mainly raised for eggs/meat production. The breeding these birds for producing hatching eggs, is gaining more business attraction.

Similarly, Chaitanya is an improved native bird strain developed by Chaitanya Breeders & Kanade Poultry Farm, Ahmednagar, Maharashtra. The Chaitanya bird has characteristics of single comb, broad deep chest, plumage colour brown, multi colored, wattle red colored, small red or white ear lobes, shank and toes are yellow, massive look, light feathered, alert, deep and fleshy. It is expected that the Chaitanya bird gain the live body weight approx 1.2 kg within 75 days period on intensive rearing with 2.75 feed conversion ratio. The acceptable mortality is within 5 % during the rearing period of two and half months. Due to unique characteristic, the bird's Chaitanya gained wide publicity and bird become more popular. Last couple of years the demand for Chaitanya birds is increased tremendously. To catch the demanding market of colored birds, farmers started rearing Chaitanya birds intensively.

Farmers in and around surrounding of Nagpur were regularly coming with queries of feeding to Chaitanya bird. Ultimately, the available commercial broiler and cockerel feed is the option for feeding; certainly the nutrient requirements of Chaitanya birds are different from the commercial broiler and cockerel. Hence, it was interesting to know the protein and energy requirements of Chaitanya bird during starting phase (0-9 week) to optimize the growth performance and economics. The base of the nutrient requirements for improved native chicken is considered on the basis of data available in the book nutrient requirements of animals (Nutrient requirement of poultry) published by Indian Council of Agriculture Research, New Delhi 2013 (Rameshwar Singh). Considering the wide market demand of locally available Chaitanya chicks and queries about their feeds gave thought to investigate protein and energy requirements of Chaitanya birds to prepare economical diet. Therefore, the present work was planned to evaluate protein and energy requirements of native cross Chaitanya birds with the following objectives.

- To investigate the protein and energy requirements of Chaitanya native cross birds for optimum growth performance.
- To study the immunological status and meat quality of the Chaitanya native cross birds fed with different protein and energy diets.
- To calculate economics considering all the input and output of rearing Chaitanya native cross birds.

REVIEW OF LITERATURE

The review of literature regarding study on "Protein and energy requirements of improved native chicken (Chaitanya) for optimum growth performance and economization of diet for meat purpose" with respect to growth performance and economics of birds rearing is presented in this chapter.

Kingori *et al.* (2003) investigated the growth response of growing indigenous chickens between 14 and 21 weeks of age to diet protein levels. The chickens were offered diets ad libitum with 100, 120, 140, 160 and 180 g crude protein CP/kg diet. Feed intake and weight gain increased significantly between the 100 and 160 g CP/kg diets where- after they plateau. Feed efficiency measured by feed conversion ratio improved with increasing dietary protein level up to 160 g CP/kg after which there was no further improvement. It was concluded that the CP requirements 160 g/kg is adequate for these indigenous chickens between 14 and 21 weeks of age.

Toppo *et al.* (2004) studied two energy levels 2600 and 2800 Kcal ME/kg and three protein levels 18, 20 and 22% CP on day old CARI sonali male and female chicks. It was reported that gain in live body weight did not differ statistically due to the dietary levels of protein or interaction between energy and protein but differed significantly ($P<0.05$) due to energy levels. Live weight gain improved at higher levels (2800 Kcal ME/kg) of energy in comparison to lower levels (2600 Kcal ME/kg). Results indicated higher ($P<0.05$) feed conversion ratio in low energy diet as compared to higher energy levels. Through the FCR tented to be higher at low protein (18%) diet, but statistically no differences was noticed among other dietary treatments.

Nyugen *et al*. (2005) studied effects of dietary protein and energy on growth performance and carcass characteristics of Betong chicken at early growth stage and found that there was no significant interaction effect between dietary protein and energy levels in the diets. At 0-21 days of age, the Betong chicks fed with the lowest protein diet (17% CP) showed reduced live weight and weight

gain, but not at 22-42 days of age. Dietary protein levels higher than 17% CP did not show any significant effect on growth performance, although increasing dietary protein levels positively improved growth performance and feed utilization. However, the Betong chicks fed with lower protein diet converted protein to body weight gain more efficiency than those fed higher protein diets. Dietary energy contents of 3,000 and 3,200 ME kcal/kg did not alter the growth performance of the Betong chicks, while higher energy (3,200 ME kcal/kg) increased abdominal fat yield from 0.39% to 0.57% ($P<0.05$). In contrast, dietary protein levels linearly reduced abdominal fat in these animals. In conclusion, protein levels in the diets at 19% CP and energy contents between 3,000 -3,200 ME kcal/kg were met or over requirements for growth performance and carcass quality.

Burgohain *et al.* (2007) attempted the effect of protein and energy levels on growth performance of Vanaraja birds in high altitude area of Arunachal Pradesh. Four experimental ration were prepared with decreasing levels of dietary protein i.e. 23 to 20% CP and increasing levels of energy i.e. 2800 to 3100 Kcal ME /kg. No significant differences ($P<0.05$) was observed between the group in daily feed intake, however, feed intake was inversely proportional to the dietary energy levels in the rations. It was reported that feed conversion ratio as 1.31± 0.16, 1.32±0.13, 1.25±0.12 and 1.27±0.13 with ration 1 to 4 respectively. It was concluded that 22% CP and 2900 Kcal ME/kg was optimum for growth performance of Vanaraja birds in between age of 0-12 weeks.

Ngullie *et al.* (2007) conducted experiment to detemine the optimum level of energy and protein for Satpuda desi birds suitable for backyard poultry farming and its effects on performance and carcass characteristics. Two hundred and twenty five day old satpuda chicks were randomly distributed to five dietary treatments, control (T1) fed with diets containing 20% crude protein, 2800 Kcal ME/kg feed and 18% crude protein, 2850 Kcal ME/kg feed (4-8 weeks), chicks in other four treatment groups were fed on single diets containing (T2) 19% crude protein, 2800 Kcal ME/kg feed (T3, 19% crude protein and 2700 Kcal ME/kg feed), 18% crude protein and 2800 Kcal ME/kg feed T4, (T5, 18% crude protein

and 2700 Kcal ME/kg feed for treatment T5. Birds were maintained under identical managemental conditions on deep litter system for eight weeks period. The mean live body weights (g) were significantly ($P<0.01$) highest in treatment T1 followed by T2, T4, T3 and T5. Similar results were also obtained for the average weekly body weight gain and cumulative body weight gain. It was concluded that, Satpuda desi birds requires 20% CP and 2800 Kcal ME/kg feed in finisher phase for optimum performance.

Mohammad and Sohail (2008) conducted an experiment to determine the effect of different energy and protein ratio on the performance of desi chickens during growing phase (9-20 weeks), six different experimental rations having 2700 and 2900 Kcal ME and 14 and 16 % Crude Protein (CP) for female birds and 2700 Kcal ME with 14 and 16 % CP for male birds. Each of the experimental group of each the male and female chicks had the 12 replications having 20 chicks each. At the end of experiment non-significant difference was noted among the weight gain, feed intake and feed conversion ratio. It was resulted that higher energy and protein levels in the feed may not be significantly improved the growth performance of desi chicks in growing phase but significant difference was observed in the cost of feed per kg weight gain for male chicks fed experimental diets.

Reddy (2011) conducted two experimental trial each of four weeks was to investigate the effects of varying levels of energy and protein on performance of straight run Giriraja chicks. First trial was conducted to determine the optimum protein requirement for Giriraja chicks. The diet formulated with similar energy content at 2800 Kcal ME/kg while protein levels of 16, 18, 19 and 20% were used. The second trial was conducted to investigate dietary energy requirement. The protein content of the diets was maintained at 19% while dietary energy levels of 2600, 2700, 2800 and 2900 Kcal ME/kg were used. A dietary concentration of 2800 Kcal ME/kg with 19% crude protein during 0-4 weeks was adequate for optimum growth performance. There was no significant influence of varying levels of energy and protein on immune organ weights and HI response. More research is suggested to fully understand the effects of dietary energy and

protein levels on productivity and carcass characteristics of Giriraja chicks raised both in confinement and under field conditions from 0 to 20 weeks of age.

Haunshi *et al.* (2012) conducted an experiment to evaluate the effect of feeding different metabolizable energy (ME) and crude protein (CP) levels on performance of Aseel chicken during 0 to 8 weeks of age (Juvenile phase). At 1 day old, 432 chicks were randomly distributed into nine groups. Each group had 48 chicks distributed into eight replicates with six birds in each. Maize–soybean meal-based diets with three ME levels (2,400, 2,600 and 2,800 Kcal/kg) and three CP levels (16%, 18% and 20%) were fed to birds in a 3 × 3 factorial design. At the end of experiment, it was noted that the diet with 2,600 Kcal/kg ME and 16% CP would be ideal for optimum growth of Aseel birds during juvenile phase. However, to obtain better FCR, feeding Aseel birds with diet having 2,800 Kcal/kg ME and 16% CP would be ideal.

Tandekar *et al.* (2012) conducted the experiment to study the protein requirement of commercial cockerels. The study was conducted for 10 weeks of period. Trial 1 (0-5 weeks) with diet containing CP 20%, 18% and 16% in each groups. Trial 2 (6-10 weeks) with CP 18%, 16% and 14% respectively. The isocaloric energy of 2650 Kcal ME/kg and 2750 Kcal ME/kg was provided in the starter and finisher diet respectively. Mortality were not affected with different levels of protein and amino acids in diet. At the end of experiment it was concluded that the treatment with diet containing 20% of CP have higher average live body weight and average weight gain compared to treatment containing CP 18% and 16% respectively.

Mahore *et al.* (2013) conducted a study to evaluate different dietary energy levels in the diet of white leghorn cockerel (BV-300) up to tenth weeks of age. Three hundred cockerels were divided in three groups having four replicate of 25 birds in each group. Starter and finisher diets were given to the cockerel birds from 0 to 5th weeks and 6th to 10^{th} week respectively. The starter and finisher mash were formulated with three levels of metabolizable energy 2550, 2650 and 2750 Kcal/Kg and 2650, 2750 and 2850 Kcal/Kg respectively. The isonitrogenous protein percentage 20 and 18 was provided in starter and finisher diet. The result

indicated that average body weight, feed consumption, body weight gain, immune response and carcass quality were found better in cockerels receiving 2850 K cal/Kg metabolizable energy in their diet. At the end of the experiment it has been concluded that 2750 and 2850 Kcal/Kg metabolizable energy levels in starter and finisher diet of cockerel is essential along with 20 percent protein to obtain maximum growth in tropical climate of Nagpur.

Pradeep *et al.* (2013) conducted a study to evaluate the effect of different levels of protein on the growth performance of White Plymouth Rock birds. A total of 320 day old White Plymouth Rock chicks were procured and randomly divided into four dietary groups with four replicates containing 20 chicks in each replicate on completely randomized design. The experiment lasted for 56 days. Four dietary treatments consisted of 19, 20, 21 and 22% crude protein with constant energy level of 2800 Kcal ME/kg during starter phase and 17, 18, 19 and 20% crude protein with constant energy level of 2900 Kcal ME/kg during finisher phase. Results showed that different levels of protein had significant ($P \leq 0.05$) effect on body weight gain, feed consumption, feed conversion ratio, dressing percentage and abdominal fat percentage. Survivability, proximate composition of meat (moisture, total ash, crude protein and ether extract), immune status (ND and IBD) and weights of liver, heart and gizzard of White Plymouth Rock birds fed with varying levels of protein showed no significant difference ($P \geq 0.05$). Thus, it can be concluded that the optimum protein requirement for White Plymouth Rock is 22% during starter phase and 20% during finisher phase.

Thanuja *et al.* (2013) studied the effect of different levels of protein on the growth performance of Giriraja birds for a period of 56 days. Total 400 day old Giriraja chicks were procured and randomly divided into five dietary groups with four replicates containing 20 chicks in each replicate on completely randomized design. Five dietary treatments consisted of 20, 21, 22, 23 and 24% crude protein with constant energy level of 2900 Kcal ME/kg during starter phase and 18, 19, 20, 21 and 22% crude protein with constant energy level of 3000 Kcal ME/kg during finisher phase. At the end of study it was noted that the dietary protein levels had significant effect on weight gain, feed conversion ratio,

dressing percentage and abdominal fat percentage and it can be concluded that the optimum protein requirement for Giriraja is 20% during starter phase and 18% during finisher phase.

Miah *et al* (2014)[a] conducted an experiment to evaluate the effects of different dietary levels of energy on growth performance and meat yields of indigenous (*desi*) chickens up to the target weight of 950 g. Two hundred sixteen indigenous either sex chicks aged 3 weeks were considered for the feeding trial until the body weight reached at 950 g. Chicks were divided into four dietary treatments. Diets for comparison were: Very low energy density (VLED): ME 2400 Kcal/kg, low energy density (LED): ME 2600 Kcal/kg, moderate energy density (MED): ME 2800 Kcal/kg and high energy density (HED): ME 3000 Kcal/kg. Body weight and Body weight gain were improved in HED and MED diets than the birds of VLED and LED diet during a rearing period of 3-14 weeks. Feed consumption increased in birds that received HED as compared to VLED, LED and MED groups. Feed conversion ratio decreased in MED and HED dietary group than VLED, LED groups. Similarly, live weight, breast, drumstick and head weight were higher in HED, MED, LED than VLED groups respectively. Profit per bird increased with increasing level of the dietary energy densities. Energy levels of diet had no effect on survivability although birds belonging to HED suffered more from mortality. It was concluded that a nutrient density of 2800 ME kcal/kg and 23% CP would be enough to optimize growth rate and FCR of indigenous (*desi*) chickens. Hence, it is concluded that, a nutrient density of 2800 ME kcal/kg and 23% CP (MED diet) would be required for indigenous chicks to achieve a target weight of 950g at 14 weeks age if reared in confinement. It was concluded that a nutrient density of 2800 ME Kcal/kg and 23% CP would be enough to optimize growth rate and FCR of indigenous (*desi*) chickens.

Shankar *et al.* (2014) evaluated the effect of different levels of protein on the growth performance, carcass characteristics and immunological parameters of Red Cornish birds. A total of 448 day old Red Cornish chicks were randomly divided into four dietary groups with four replicates containing 28 chicks in each replicate on completely randomized design. The experiment lasted for 56 days.

Four dietary treatments consisted of 19, 20, 21 and 22% crude protein with constant energy level of 2800 Kcal ME/kg during starter phase and 17, 18, 19 and 20% crude protein with constant energy level of 2900 Kcal ME/kg during finisher phase. Results showed that different levels of protein had significant ($P \leq 0.05$) effect on body weight gain, feed consumption, feed conversion ratio and weights of gizzard. Survivability, sensory evaluation of meat, immune status (ND and IBD titers), dressing percentage, abdominal fat percentage and weights of liver and heart of Red Cornish birds fed with varying levels of protein showed no significant difference ($P \geq 0.05$). Thus, it was concluded that the optimum protein requirement for Red Cornish birds is 22% CP and 2800 Kcal ME/kg during starter phase and 20%CP and 2900 Kcal ME/kg during finisher phase.

Miah *et al* (2016)[b] conducted two feeding trials on three weeks old unsexed indigenous chicks reared in confinement to determine the effects of varying levels of dietary protein and energy on their growth performance and carcass yields. For the first trial, 360 unsexed chicks were divided into four equal groups and fed control, low protein density (LPD); moderate protein density (MPD) and high protein density (HPD) diets with CP level 11.42, 19.19, 21.30 and 23.22% in the respective diet. In the second trial, 228 chicks were fed control, low nutrient density (LND), moderate nutrient density (MND) and high nutrient density (HND) diet with ME content 3100, 2400, 2600 and 2800 kcal/kg diet and the respective CP level was 11.42, 19.05, 21.22 and 23.22%. In trial 1, birds, fed HPD diet, reached the target weight (750 g) whereas the body weight in LPD and MPD groups was lower ($P<0.05$). Feeding HND diet had a tendency of higher breast meat and drumstick meat yields than other groups. It was, therefore, concluded that a nutrient density of 2800 ME kcal/kg and 23% CP may be suggested for indigenous chicks to obtain profitable body weight (approx. 850 g) in confinement.

Deepak *et al*. (2017) evaluated the energy and protein requirements of Rajasri chicks from 0-8 weeks of age and to assess the effect of feeding varying levels of energy and protein on performance, nutrient utilization and serum biochemical profile. For this purpose, 288 day-old Rajasri straight run chicks were

procured and allotted randomly to nine treatments with four replicates and eight chicks per replicate. Nine experimental diets constituted three levels of energy (2400 Kcal, 2600 Kcal and 2800 Kcal ME/kg) each with three levels of protein (20, 18 and 16%). The results indicated that there was significant ($P<0.01$) influence of dietary groups on the final body weight and cumulative body weight gains. The dietary groups fed with 2600 and 2800 Kcal ME/kg with 20% CP recorded highest cumulative body weight gains, while significantly ($P<0.01$) lowest body weight gains were seen in groups fed with 2400 Kcal ME/kg with 16% CP. The feed consumption of birds supplemented with 2400 Kcal ME/kg with 18% CP was significantly ($P<0.05$) higher followed by 2400 Kcal ME/kg with 16 and 20% CP, 2600 Kcal ME/kg with 16, 18 and 20% CP. Feed consumption was comparable between the birds fed with 2400 and 2600 Kcal ME/kg. Birds in the dietary groups 2800 Kcal ME/kg with 20, 18 and 16% CP consumed significantly ($P<0.05$) less feed. Feed conversion ratio of Rajasri chicks throughout the experimental period (0-8 weeks) was significantly ($P<0.01$) influenced by feeding varying levels of energy and protein. Chicks which were fed a combination of 2400 ME with 16% CP recorded poor feed conversion ratio (4.17) when compared to those which were fed 2600 or 2800 ME with 20% CP which recorded the best feed conversion ratio (3.33, 3.32) among different dietary groups. However, it was not significantly ($P>0.05$) influenced either by different levels of CP or CP and ME interaction. It is concluded that Rajasri chicks during 0-8 weeks require 2600 Kcal of ME with 20% CP to attain optimum performance.

Kamble *et al.* (2018) studied the nutrient requirement of Kadkanth chicken during starting phase (0-6 wk) to optimize the growth performance. 300 day old birds were equally distributed in 5 treatments. Each treatment was subjected to 3 replicates with 20 birds in each replicate. The birds were reared on deep litter system of management and all the groups were provided with similar environmental and managemental conditions throughout experimental period of six weeks. The different dietary treatment groups were A (control) offered diet containing CP-18% , ME-2700 Kcal/kg, Methionine-0.38%, Lysine-0.85% and the treatment groups B, C, D and E were offered feed with diet containing CP-19%, ME- 2800 Kcal/kg, Methionine-0.40%, Lysine-0.90%, CP-20%, ME- 2900

Kcal/kg, Methionine-0.48%, Lysine-1%, CP-21%, ME-3000 Kcal/kg, Methionine-0.45%, Lysine-1.10% and CP-22%, ME-3100 Kcal/kg, Methionine-0.50%, Lysine-1.2% respectively. Kadaknath chicken fed starter diet with ME 3000 kcal/kg, CP-21%, Lysine-1.10% and Methionine-0.45% recorded improved growth performance, better immune response and lowest cost of production at the end of 6 weeks of age.

Rathod *et al.* (2018) conducted an experiment to observe the nutrient requirement of Kadaknath chicken during finisher phase to optimize the growth and economics performance in 270 Kadaknath bird in intensive system from 7^{th}wk to 14^{th}wk, in this experiment birds were individually weighed and distributed into five groups having three replicate containing 18 birds in each. Five different experimental rations were formulated with five levels of protein with control A, *viz.,* 18%, 17% and 18%, 19% and 20% each with three levels of energy (2700, 2900, 3000, 3100 and 3200 Kcal metabolizable energy (ME/kg). It was resulted that Kadaknath birds fed with finisher diet containing a CP-19%, ME-3100 Kcal/kg from 7^{th} to 14^{th} week of age recorded better growth performance and lowest cost of production.

MATERIAL AND METHODS

The present experiment was conducted for nine weeks at Poultry Research and Training Center, Department of Poultry Science; Nagpur Veterinary College. The research was aimed to investigate the protein and energy requirements of Chaitanya improved native chicken for the better growth performance. The details of the materials used as well as various techniques and methodologies adopted during the experiment are presented in this chapter.

Experimental birds

The Chaitanya improved chicken variety is popularly known as "Chaitanya desi" a multiple cross coloured bird mostly acceptable for backyard poultry farming. The experiment was conducted on 540 chaitanya desi birds by feeding different combination of protein and energy feed for nine week of periods to achieve locally acceptable marketable weight. The day old chicks were procured from Chaitanya Poultry Feeds and Hatcheries Pvt. Ltd., Ahmednagar (Maharashtra). On the day of arrival of day old chicks, the birds were weighed to know the day old live body weight and later distributed in three different dietary treatment groups. Each dietary treatment was consisting of 180 day old chicks which were divided in three replicates of 60 chicks in each.

Experimental diets and Nutrient composition

The treatment diets were formulated to prepare the pre-starter phase (0-2 wk), starter phase (3-7wk) and finisher phase (8wk-liquidation) feed. All the diet was prepared by using major ingredients as maize, soya, DORB, veg oil etc. The birds were maintained on adlib feeding pattern. The feed offered with weighed quantity to know the feed consumption of each replicate bird. The experimental feed formulation and calculated nutritional composition is given in the table2.

Table 3.1: Experimental dietary treatment groups for Chaitanya birds

Treatment groups	Details of dietary treatments	No. of replicates/ treatment	No. of birds / replicate	No. of birds /treatment
Control*	**Starter (0-4wk)** CP-20% , ME-2600Kcal/kg Methionine-0.42% Lysine- 0.92% **Finisher (5- Liq.)** CP-16%, ME-2600Kcal/kg Methionine- 0.34% Lysine- 0.75%	03	60	180
T-1	**Pre-starter(0-2wk)** CP-21% ME-2650Kcal/kg Methionine-0.50% Lysine- 1.10% **Starter(3-7wk)** CP-18% ME-2750Kcal/kg Methionine-0.48% Lysine-1.00% **Finisher (8-Liq.)** CP-17% ME-2850Kcal/kg Methionine-0.46% Lysine- 0.90%	03	60	180
T-2	**Pre-starter(0-2wk)** CP-20% ME-2600Kcal/kg Methionine-0.45% Lysine- 1.00% **Starter(3-7wk)** CP-17% ME-2700Kcal/kg Methionine-0.40% Lysine-0.90% **Finisher (8-Liq.)** CP-16% ME-2800Kcal/kg Methionine-0.35% Lysine- 0.80%	03	60	180
Total Number of birds				**540**

*Nutrient requirement of Poultry by ICAR, New Delhi (Rameshwar Singh, 2013

Plate No. 3.1 Weighing of Experimental Day old chicks

Table 3.2: Feed

Treatments groups								
Feed Ingredients (%)	**Control Starter**	**Control Finisher**	**T-1 Pre-starter**	**T-1 Starter**	**T-1 Finisher**	**T-2 Pre-starter**	**T-2 Starter**	**T-2 Finisher**
Maize	40.5	47.5	40.0	42.5	45.5	45.0	49.0	54.5
Soya DOC Hypro	20.0	10.0	26.0	20.5	16.0	21.0	17.0	12.0
De-oiled rice bran	36.0	40.0	31.0	33.0	35.0	31.0	29.5	30.0
Turmeric	0.020	0.025	0.020	0.020	_	0.020	0.020	_
Vegetable oil	_	_	_	0.50	1.00	_	1.00	1.10
Monocalcium phosphate(MCP)	1.15	1.15	1.15	1.15	0.80	1.15	1.15	0.80
Limestone powder (LSP)	1.30	1.30	1.30	1.30	1.40	1.30	1.30	1.40
Salt (NaCl)	0.28	0.28	0.28	0.28	0.25	0.28	0.28	0.25
Trace mineral mixture	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Vitamin premix	0.06	0.06	0.06	0.06	0.05	0.06	0.06	0.05
DL- Methionine	0.15	0.115	0.20	0.16	0.10	0.22	0.17	0.11
L-Lysine	0.09	0.17	0.09	0.09	0.05	0.28	0.19	0.15
Choline chloride (60%)	0.12	0.12	0.12	0.12	0.14	0.12	0.12	0.14
Toxin binder	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Coccidiostat (Robinidine, Maduramycin)	0.035	0.035	0.035	0.035	0.05	0.035	0.035	0.05
Sodium bircabonate	0.12	0.12	0.12	0.12	0.20	0.12	0.12	0.20
Emulsifier	_	_	_	0.03	0.10	_	0.03	0.10
Phytase	0.0125	0.0125	0.0125	0.0125	0.015	0.0125	0.0125	0.015
Econase	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
BMD (Bacitracin Methylene Disalicylate)	_	_	_	_	0.02	_	_	0.02
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Plate No. 3.2 Brooding of Chaitanya Chicks

Table 3.3: Calculated nutrient composition of different diets of treatments groups

Metabolizable E.(Kcal/kg)	2650	2675	2675	2765	2855	2635	2765	2825
Crude protein (%)	20.25	16.79	20.89	18.50	17.89	19.86	18.96	16.78
Ether extract (%)	2.99	4.10	3.03	2.64	3.45	4.39	3.75	2.78
Crude fibre (%)	7.17	7.10	5.74	6.11	5.24	6.32	5.5	5.01
Total lysine (%)	0.92	0.75	1.10	1.00	0.90	1.00	0.90	0.80
Total methionine (%)	0.42	0.34	0.50	0.48	0.46	0.45	0.40	0.35
Calcium (%)	1.09	0.96	1.08	1.04	1.01	1.02	1.00	0.90

Plate No. 3.3 Vaccination of NCDV on 7th day

Plate No. 3.4 Deep litter housing system of experimental birds

Housing and management

The experimental Chaitanya chicks were reared on deep litter system and all the groups were provided similar environmental and managemental condition throughout experimental period of 0-9 weeks of age. Brooding was done for first three weeks of age by providing sufficient heat and light @ 2 watt per bird (electrical bird) in each replication. Afterwards, sufficient artificial light was provided during night hours throughout the experimental period of nine weeks. The birds were provided with 1.5 square feet of floor space per bird till end of experiment. The standard management and brooding practices was carried out to optimize the performance. Mortality was recorded as and when occurred. Birds were weighed for calculation of mortality-corrected feed conversion ratio (FCR). Replicate wise birds (in group) and feed were weighed weekly to calculate growth, feed conversion ratio (FCR) and feed consumption. The birds were vaccinated with a standard vaccination schedule recommended for low input technology birds.

Vaccination and medication

The jaggery water was given on the day of arrival of chicks. The birds were vaccinated against Ranikhet disease (Lasota strain) on 7^{th} day of age and further booster of Ranikhet disease (Lasota strain) was carried out on 28^{th} day of experiment. Birds were vaccinated against Infectious bursal disease on the 14^{th} day and its booster dose was given on 21^{th}day.The birds were vaccinated against Ranikhet disease (Lasota strain) at 8^{th} week of age.

Parameters studied:

During experiment, following parameters were studied.

Growth parameters

a) Weekly live body weight

On the first day of the experimentall the chicks were weighed and randomly divided into treatment groups. Subsequently all the birds were weighed

week wise up to 9 weeks. During the experiment, birds were weighed collectively replicate wise to calculate the mean live body weight perbird.

b) Cumulative Weekly feed consumption

The experimental birds were offered with acalculated feed during the experimental period and at the end of each week total feed left over were recorded to obtain the feed intake of thebirds. The feed intake data was recorded replicate wise and mean feed intake was used to calculate feed consumption per bird.

c) Cumulative Weekly feed conversion ratio

The feed conversion ratio was calculated by considering the total feed intake and total gain in body weights of the birds. The recorded data of feed intake and gain in body weight were used to calculate feed conversionratio.

d) Mortality

Mortality was recorded as and when occurred. The birds were weighed and noted to calculate the feed conversion ratio. The dead birds were disposed of properly after the post mortem to find out the cause of death.

Immunological parameter

Humoral immune response was judged by estimating haemagglutination inhibition titer against New castle Disease virus (NCDV) on 21^{st} and 42^{nd} day of age of birds. Six birds from each treatment (two birds each replicate) were randomly selected for the blood collection. The serum was separated by centrifugation at 3000 RPM for 20 minutes and decanted into clean, sterile plastic vials and stored under deep freeze at –18ºC to –20ºC. Haemagglutination inhibition (HI) test was performed as per procedure of O.I.E (1992). Two fold serial dilutions of antigen and serum was made for HA and HI, respectively. The 1% chicken RBC was prepared by collecting the blood from healthy bird and mixed with equal volume of Alsiever's solution. Aliquot of blood was washed four times in sterile normal saline by centrifugation and 1% concentration of washed erythrocytes was prepared and stored at 4˚C. A commercial Lasota strain

Plate No. 3.5 Blood collection for HI titre

of NCDV was used as antigen for HI test. The HI titre was expressed as log2 value of the highest dilution of serum causing complete inhibition of 4HA unit of antigen.

New Castle Disease (ND) Titre

Haemagglutinatiuon (HA) test

Procedure-

HA test was performed in 'U' bottom microtitre plate as per O.I.E.

Procedure

1. 50µl of PBS (0.1% & 7.2 pH) was added in first well of U bottommicro titer plate.
2. 50µl of PBS was distributed in subsequent well (11well).
3. 50µl of antigen was added in firstwell.
4. Two fold serial dilutions were made up to 11^{th}well and last well was kept ascontrol.
5. 50µl chicken RBC (1% v/v) added to eachwell.
6. After gentle mixing the plate were covered and then kept at 37^0C for 45 minutes forincubation.
7. The micro titre plates were read under brightlight.
8. The reciprocal of highest dilution of the antigen showing 50% haemagglutinationwas considered as HAtiter.
9. The original virus was diluted to contain 4 HA units and was used as HA antigen in the HI test.

Haemagglutination Inhibition (HI) test Procedure-

HI test was performed in 'U' bottom microtiter plate as per O.I.E.

Procedure

1. 25µl of PBS (0.1% & 7.2 pH) was added in all well of U bottom microtiterplate.

2. 25µl of serum was added in first well and serial twofold dilution ofserumwas done.
3. 25µl of 4HA units of antigen was added in each well.10 min ofincubation period was given.
4. 25µl chicken RBC (1% v/v) added to eachwell.
5. After gentle mixing the plate were covered and then kept at 37^0C for 45 minutes forincubation.
6. The micro titre plates were read under brightlight.
7. The HI was expressed as the highest dilution of serum causing complete inhibition of antigen.

Meat quality parameter

Carcass evaluation

At the end of the experiment, one male and two female close to mean average body weight were selected from each treatment. The selected birds were kept for fasting for 8 hr with ad-libitum fresh drinking water before the slaughter. The birds were slaughtered by halal method to record the carcass traits viz., dressed weight, fat percentage, Cut-up part yields (breast, thigh, drumsticks, back, neck and wing) and giblets (liver, heart and gizzard). The breast muscle samples were properly stored at -20°C. The same samples were processed for proximate meat analysis. The standard protocols were followed to estimate the meat moisture, crude protein, fat and ash.

Proximate composition

The proximate composition of various ingredients of feed was determined using the AOAC (2005) standard methods and the proximate composition viz., moisture, fat, ash and protein content of chicken were analyzed following AOAC (2005) procedure.

Dry Matter (DM)

The moisture content of the sample was determined by heating it to a constant weight in an oven at 100^0-105^0 Celsius under air pressure. Dry matter was the consistent weight of a sample after it had been completely dehydrated.

$$\text{Moisture \%} = \frac{\text{Loss in weight}}{\text{Weight of sample}} \times 100$$

Dry matter % = 100 - Moisture percent

Crude Protein (CP)

By digesting 1 g dried sample with 30 mL concentrate $H_2SO_4$and adding 5 g of digestion mixture made of sodium sulphate and copper sulphate in a 9:1 ratio, the crude protein content was determined using Kjeldhal's method. The digestion was continued for another 2-3 hours till it was clear. After repeated washes with distilled water, the digested content was transferred to a 100 mL volumetric flask and 100 mL volume was made. A 10mL aliquot was then fed to the distillation assembly, along with 15 mL of 40%NaOH solution. Ammonia vapours were trapped in 15 mL of Tashiros indicator, which was made by mixing 2 percent boric acid in 1000 mL with 200 mL pure alcohol, 12 mL methyl red (0.1%), and 6 mL bromocresol green (0.1%). A standard N/10 H_2SO_4 solution was used to titrate the ammonia boric acid complex (ammonium borate). The crude protein content was calculated using the formula mentioned below, with 1 mlof N/10 H_2SO_4= 0.0014 g nitrogen.

$$\text{Crude protein \%} = \frac{\text{Vol. of N/10 } H_2SO_4 \text{ x } 0.0014 \text{ x } 6.25 \text{ x Aliquot prepared}}{\text{Aliquot taken for distillation x Wt. of sample}} \times 100$$

In 100 g of protein, 16 g of nitrogen is present on average; so, 1 g of nitrogen equals 6.25 g protein. (Factor 6.25 to convert nitrogen into protein)

Ether Extract (EE)

The ether extract was evaluated by extracting 3 g of dried sample in Soxhlet assembly for about 7 hours with petroleum ether (60-80^{0}C). The extraction flask was placed in a hot air oven at 100°C for 1 hour after extraction, cooled in a desiccator and weighed. The weight of fat extracted by the petroleum ether is recovered in the receiver flask and the extract was computed using the formula below.

$$\text{Ether extract \%} = \frac{\text{Weight of fat}}{\text{Weight of sample}} \times 100$$

Total Ash (TA)

For total ash estimate, a 3gdried sample was weighed in a silica crucible, decarbonised on a heater to remove smoke and then ignited at 600^{0}C for 2-3 hours in a muffle furnace. With the use of metal tongs, the crucible was retrieved from the furnace, cooled in a desiccator and weighed. The weight of ash is the weight of the content in the crucible after ignition and it was determined using the formula below.

$$\text{Total Ash \%} = \frac{\text{Weight of total ash}}{\text{Weight of sample}} \times 100$$

Economics

The production cost of rearing the Chaitanya chicks for complete experimental period (0-9 weeks) was calculated by taking into consideration of sum of the cost of the chicks, feed, vaccination, medication and other miscellaneous expenses. The net profit per bird or per kg was calculated considering average selling price of the year on live body weight basis as per the local market.

Statistical analysis

The data obtained in the experimental study period was subjected to statistical analysis using SPSS software package version 25.0 in complete randomized block design (CRBD). One way ANOVA was applied to all parameters. The significant differences were observed among the treatment means, they were separated by Duncan's multiple range test (Duncan, 1955). Replicates were used as experimental unit for analysis of all the parameters. A probability value of ≤ 0.05 was considered significant in experiments.

RESULTS AND DISCUSSION

The present experiment was carried out to determine the "Protein and Energy requirements of improved native chicken (Chaitanya) for optimum growth performance and economization of diet for meat purpose". In the local market native cross, low input technology birds were available for meat purpose, usually the available broiler or layer male (cockerel) feed is used for feeding purpose. Hence, to achieve best performance and economize the diet three experimental feed were prepared as per Nutrient requirement of poultry (Rameshwar Singh, 2013). The effect of different protein and energy levels diets were fed to improved native cross Chaitanya birds to assess their performance. The results obtained from the experiment are discussed below.

4.1 Growth studies/Parameters

4.1.1 Average Weekly live body weight

The average weekly live body weights of Chaitanya birds till nine weeks of age on different dietary feed treatments are presented in Table 4.1.The same results are graphically presented in Fig 4.1.

It was revealed from the table 3, the initial average live body weights of bird were 30.44 ± 0.07, 29.74 ± 0.43 and 29.69 ± 0.03 g for treatment group Control, T_1 and T_2 respectively. At the end of ninth week body weight were achieved to 1033.33±9.33, 1007.00±5.56 and 1023.66±9.83 for group Control, T_1 and T_2 respectively. Thus the results indicated that there was no significant difference in live body weights of any of the treatment groups at any phase. However, the birds fed with control diet recorded highest live weight at the end of the rearing period. It was observed that increase in protein level enhances the live body weight in treatment groups at initial stage (4 week) but it was not statistically significant ($P>0.05$) among any of the treatment groups. In later stage of production the control diet fed birds were at par compare to treatment diet fed Chaitanya birds and achieved the highest

live body weight, though the difference was negligible at 9 week age. In fact the treatment 2 diet which was nutritionally close to the control diet performed equally to the control diet fed birds.

The present findings were in agreement with Toppo *et al.* (2004) who observed significantly higher live body weight with higher level of dietary energy in the diet of cari sonali male and females. Burgohain *et al*. (2007) also reported that different protein and energy levels affects growth performance of vanraja birds. Miah *et al*. (2014) also reported that the body weight was significantly ($P<0.001$) improved in high energy density (ME-3000 Kcal/kg, CP-23 %) in starter phase and moderate energy density (ME-2800 Kcal/kg. CP-23%) diets than low energy density (ME 2400 Kcal/kg, CP-23%) and (ME-2600 Kcal/kg. CP-23%) diets during the period of 3-14 weeks of age in indigenous (desi) chickens. However, Reddy (2011) observed that the dietary concentration of 2800 Kcal ME/kg with 19% crude protein during 0-4 weeks was sufficient for optimum growth performance in Giriraja chicks. He observed increased protein level enhances the body weight but it was not statistically significant ($P>0.05$) among the various treatment groups fed with different level of protein. Haunshi *et al*. (2012) concluded that the diet with 2,600 Kcal/kg ME and 16% CP would be ideal for optimum growth of Aseel birds during juvenile phase.

The average weekly live body weight changes in Chaitanya birds fed different levels of protein and energy diet were ($P>0.05$) non-significant in all treatment groups. At the end of 9^{th} week of age, the mean live body weight values were inclined towards higher side in Control group (CP-20%, ME-2600 Kcal/kg, methionine-0.42% and lysine-0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase) than the treatment diet fed birds.

Table. 4.1 Weekly live body weight (g/b) of Chaitanya birds fed different dietary treatments.

Groups	1 wk	2 wk	3 wk	4 wk	5 wk	6 wk	7 wk	8 wk	9 wk
Control	58.06±1.79	130.03±1.53	208.40±3.70	297.33±8.66	416.33±8.56	530.33±23.91	742.66±7.31	933.33±13.33	1033.33±9.33
T-1	59.63±1.21	129.73±6.09	208.70±5.65	312.00±24.97	411.33±9.40	547.66±28.22	679.00±28.58	928.33±18.78	1007.00±5.56
T-2	56.43±1.38	126.83±4.49	201.76±2.60	311.33±12.41	435.66±17.05	572.00±17.43	727.33±11.46	943.66±5.92	1023.66±9.83
SEM	0.87	2.28	2.37	8.76	7.17	13.26	13.24	7.22	5.71
P-Value	0.374	0.858	0.463	0.793	0.393	0.498	0.108	0.735	0.164
	NS	NS	NS	NS	NS	NS	NS	NS	NS

Fig. 4.1 Weekly live body weight of Chaitanya chicken in different dietary treatments

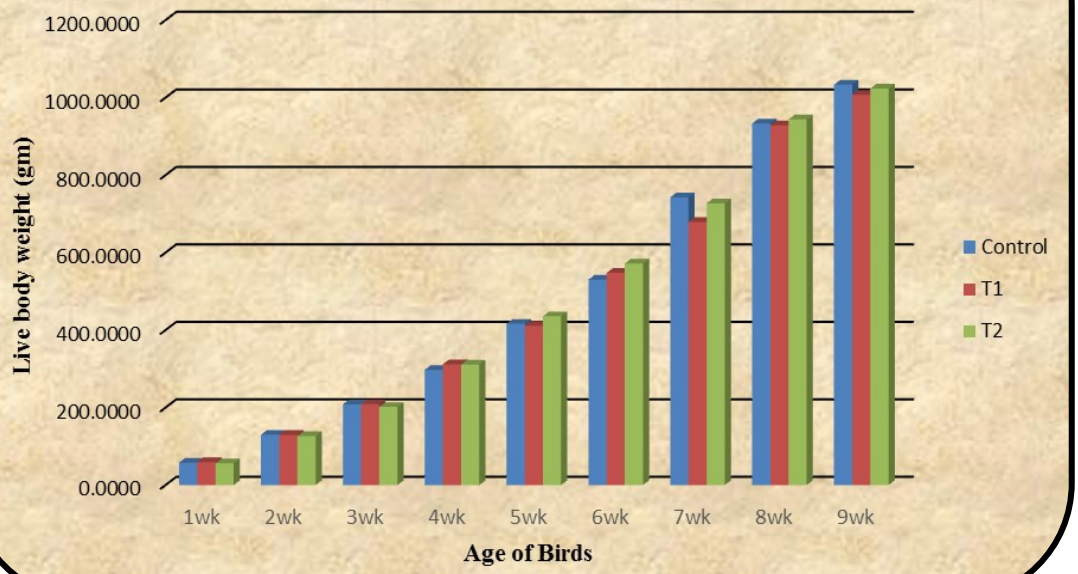

Fig. 4.2 Cumulative feed consumption of Chaitanya chicken in different dietary treatments

4.1.2. Weekly cumulative feed consumption

The average weekly cumulative feed consumption of Chaitanya birds from first to ninth week of age in different treatment groups is presented in Table.4.2 and has been graphically depicted in Fig. 4.2.

The total feed consumption per bird during nine weeks period was 3104.53 ± 110.39, 3187.20 ± 19.49 and 3132.56 ± 91.28 gm for Control, T_1 and T_2 groups respectively. In the first week of experiment the difference in feed intake was significantly differ among treatment groups. The treatment 2 diet fed birds recorded highest significant ($P<0.001$) feed consumption compare to control and T1 diet fed birds. . However, there was non-significant difference in feed consumption between Control, and treatment groups till the liquidation of the flock of the trial.

Table. 4.2 Cumulative feed consumption (g/b) of Chaitanya birds fed different dietary treatments.

Groups	1 wk	2 wk	3 wk	4 wk	5 wk	6 wk	7 wk	8 wk	9 wk
Control	48.50^{b}±1.22	156.00±2.93	373.53±8.36	717.86±29.47	1016.20±35.05	1472.53±51.04	1973.20±66.84	2500.53±83.86	3104.53±110.39
T-1	55.20^{a}±1.19	168.96±9.23	390.80±8.61	703.03±9.10	1028.60±22.02	1488.16±24.72	2001.73±22.53	2535.96±15.56	3187.20±19.49
T-2	42.56^{c}±0.66	146.03±6.23	375.13±10.33	669.36±25.61	1005.26±44.4	1461.83±65.13	1988.40±76.45	2504.96±82.29	3132.56±91.28
SEM	1.89	4.69	5.24	13.61	17.85	25.22	30.31	34.66	43.46
P-Value	0.000	0.126	0.437	0.377	0.897	0.933	0.946	0.924	0.784
	P<0.001	NS	NS	NS	NS	NS	NS	NS	NS

The results are in agreement with Kingori*et al.* (2003) who reported that the birds fed on diet containing 160 and 180 g CP/kg showed non significant (P>0.05) difference in feed intake. Nguyen *et al.* (2010) reported that there was no difference in feed intake but protein efficiency was increased significantly (P<0.05) with increase in dietary protein level. Reddy (2011) observed the highest feed intake was recorded in treatment group containing 20% CP and it was significantly (P<0.05) higher than the treatment group containing 16, 18 and 19% CP in diet in first week of experimental period. Thanuja*et al*. (2013) stated that the dietary protein levels had significant effect on feed conversion ratio and the optimum requirement of protein is 20 per cent during starter phase in Giriraja birds.

The average cumulative feed consumption at the end of 9^{th} week were 3104.53 ± 110.39, 3187.20 ± 19.49 and 3132.56 ± 91.28 g/bird, for Control and treatment groups T-1 and T-2, respectively. There was non-significant (P>0.05) differences in cumulative feed intake per bird in all treatment groups.

4.1.3. Weekly Cumulative feed conversion ratio

The data pertaining to average weekly Cumulative feed conversion ratio of Chaitanya birds in terms of cumulative feed intake per unit live body weight for different treatments from day old to ninth week of age are presented in table 4.3. The same data has been graphically presented in Fig.4.3.

Fig. 4.3 Cumulative feed conversion ratio of Chaitanya chicken in different dietary treatments

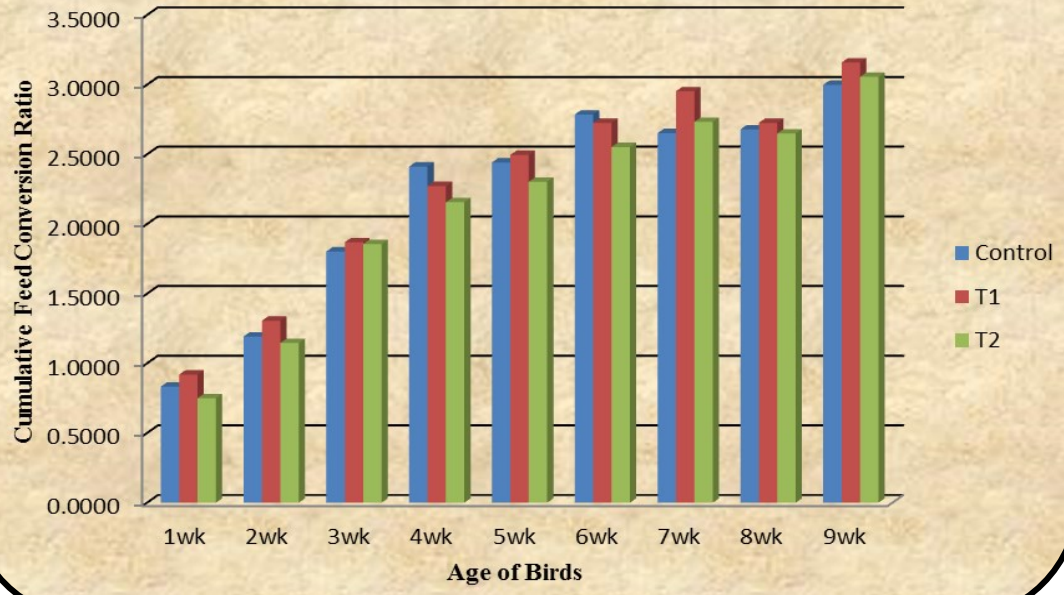

Fig. 4.4 Mortality (%) of Chaitanya chicken in different dietary treatments

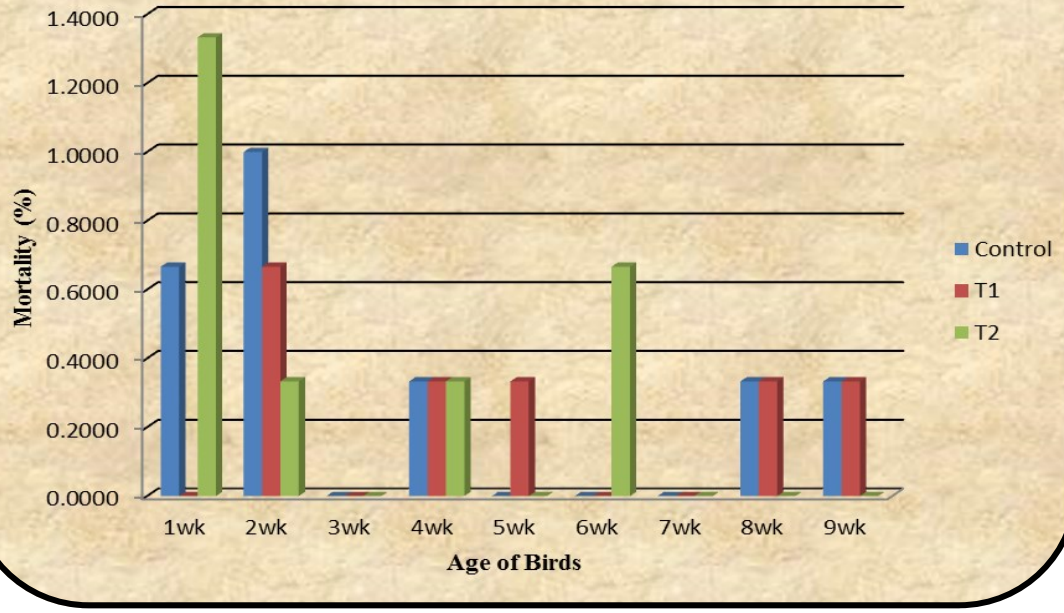

Table.4.3 Weekly cumulative feed conversion ratio of Chitanya birds fed different dietary treatments.

Groups	1 wk	2 wk	3 wk	4 wk	5 wk	6 wk	7 wk	8 wk	9 wk
Control	0.83^{b}±0.008	1.19±0.01	1.80±0.07	2.41±0.10	2.44±0.13	2.78±0.19	2.65±0.11	2.68±0.12	3.00±0.13
T-1	0.92^{a}±0.01	1.30±0.12	1.87±0.08	2.27±0.15	2.49±0.07	2.72±0.13	2.95±0.12	2.72±0.03	3.16±0.03
T-2	0.75^{c}±0.01	1.14±0.008	1.85±0.05	2.15±0.15	2.30±0.05	2.55±0.12	2.73±0.14	2.65±0.10	3.05±0.06
SEM	0.02	0.04	0.03	0.07	0.05	0.08	0.07	0.04	0.05
P-Value	0.000	0.330	0.801	0.477	0.389	0.569	0.295	0.849	0.4841
	P<0.001	NS	NS	NS	NS	NS	NS	NS	NS

Significantly (P<0.001) poor weekly cumulative feed conversion ratio was recorded at first week in treatment T1 as compared to treatment 2 and Control diet fed birds.

However, there was non-significant (P>0.05) difference in weekly cumulative feed conversion ratio between treatment groups and Control in the subsequent days till ninth weeks. At the end of the experiment, the best feed efficiency was recorded in control group birds fed diet.The results are in agreement with Thanuja*et al*. (2013) stated that the dietary protein levels had significant effect on feed conversion ratio and the optimum requirement of protein is 20 per cent during starter phase in Giriraja birds. Miah *et al*. (2014) reported that the feed conversion ratios were similar in moderate energy density (ME-2800 Kcal/kg, CP-23%) and high energy density (ME-3000 Kcal/kg, CP-23%) treatment groups but differed significantly (P<0.05) from very low energy density (ME-2400 Kcal/kg, CP-23%) and low energy density (ME-2400 Kcal/kg, CP-23%) groups. Similarly, Kingori *et al*. (2003) also reported that the feed conversion ratio improved with increasing dietary protein level up to 160 g CP/kg after which there was no further improvement in indigenous chickens.

The average weekly cumulative feed conversion ratio in Chaitanya chickens at 9^{th} week of age was 3.00 ± 0.13, 3.16 ± 0.03 and 3.05 ± 0.06 respectively, for Control, T-1 and T-2 groups respectively. The higher weekly cumulative feed conversion ratio recorded in treatment Control may be attributed to the higher LBW and less feed consumption recorded in this group due to the energy and protein content of the feed and vice versa in treatment T1 and T2. It was concluded that the best feed efficiency was recorded in control group Chaitanya birds fed diet as per Nutrient requirement of Poultry by ICAR, New Delhi recommendations.

4.1.4. Mortality

The data pertaining to mortality during the entire experiment period (0-9th wk) from all the treatment groups are presented in Table 4.4. The graphical representation of the same is given in fig. 4.4.

The mortality in Treatment and Control groups to T2 was 4.44, 3.33 and 4.44 % respectively. Lowest mortality was observed in the treatment group T-1. Thus, total mortality in different treatment groups was well within limits. Post mortem finding were suggestive of no specific disease or disease condition.

Table 4.4: Mortality percentage in different dietary treatment of Chaitanya birds

Groups	No. of b	No. of Mortality	Mortality (%)
Control	60	8	4.44
T-1	60	6	3.33
T-2	60	8	4.44

The present findings are in accordance with Mohammad and Sohail (2008) observed that there was no significant mortality percentage due to different dietary protein and energy ratio in indigenous chickens. Miah et al. (2014) who reported that energy levels of diet had no effect on survivability. Tandekar (2012) also concluded that total mortality during experimental period in different dietary treatment groups in cockerels was well in limits and the mortality did not reveal any post mortem findings suggestive of dietary deficiency.

The overall mortality percentage was 4.44, 3.33 and 4.44 % in control and treatment groups, T-1 and T-2 respectively. Overall mortality in all treatment groups from 1st day to 9th week's period was in within limit.

4.2. Immunological parameter

4.2.1.Humoral immune response :

The immune response was judged by employing HI test to detect the antibody titer against New Castle Disease at 3rd, 6th and 9th weeks.

The results for mean HI antibody titers of different treatment groups against New Castle Disease at 3rd, 6th and 9th weeks was presented in Table 4.5.The same data has been graphically depicted in Fig.4.5.

Table. 4.5. Hemagglutination inhibitor (HI) titer (log2) against NCDV

Groups	Control	T1	T2	SEM	P value	
3rd wk	2.25±0.05	2.30±0.05	2.41±0.02	0.030	0.102	NS
6th wk	4.69^{b}±0.02	4.89^{a}±0.03	4.08^{c}±0.02	0.084	0.000	P<0.05
9th wk	6.50±0.34	6.33±0.21	6.00±0.63	0.285	0.052	NS

The average HI titer (Log2) against ND disease on 3rd week among the different groups were non-significant. The numerically higher ND antibody titers were recorded in treatment group T-2 at 3rd week of age. There was a significant change observed in 6th week in which treatment group T-1 showed better value of HI as compare to Control and T2 diet fed birds.. However, there was non-significant (P>0.05) difference for ND titers in all treatment groups at 9th week of age.

The present findings are in agreement with Tandekar (2012) who reported that there was non-significant difference in the HI titers of all treatment groups up to 3rd week of age. Similar to the present study Thanuja *et al* (2013) observed that there was no significant difference among the different treatment groups for HI titre against the ND vaccine at 1st and 3rdweeks of age. However, Mahore (2013) reported that there was non-significant difference in the mean value of HI titers of all treatment groups up to 10th week of age in cockerels.

In the present experiment, it can be concluded that dietary energy and protein level has no significant effect on antibody titer response against Newcastle disease in Chaitanya birds at the age of marketing.

4.3. Carcass evaluation

The data of carcass yield of Chaitanya birds at the end of the experiments (9thweek) were presented in Table 4.6 and the graphical representation for the same is given in fig. 4.6.

At the end of the experiment, male and female birds close to mean average body weight were selected from each replicate for carcass evaluation. The selected birds were kept for 8 hr. fasting with ad-libitum fresh drinking water before the slaughter. The birds were slaughtered by halal method to record the carcass traits viz., Cut-up part yields (breast, thigh, drumstick, back, neck and wing) and giblets (liver, heart and gizzard).The cutup parts back, breast, drumstick, neck, thigh and wing percentage were significantly not differ within any of the treatment group irrespective of feeding pattern.

Fig. 4.6 Carcass yield (% live weight) of Chaitanya chicken in different dieraty treatments

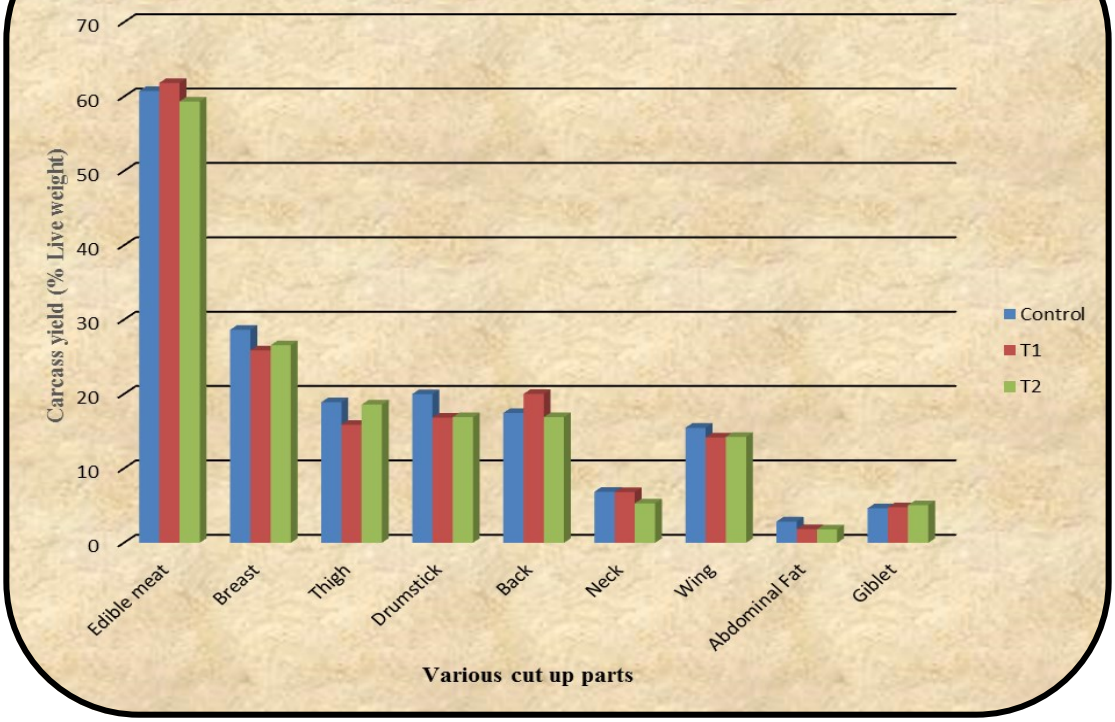

Fig. 4.5 Mean serum HI titer (log2) against New castle disease virus (NCDV) of experimental Chaitanya birds

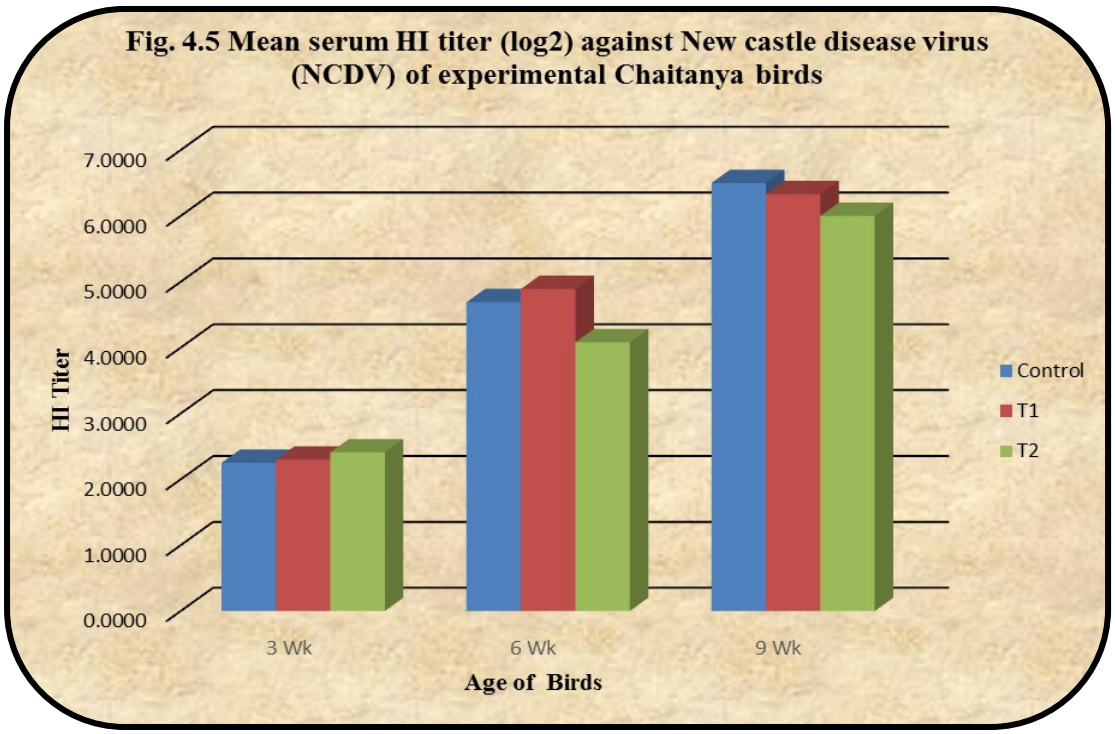

Table. 4.6 Carcass yield (g) of Chaitanya birds at the end of 9thwk of age

Groups	Carcass Yield %								
Treatment/	Edible meat	Breast	Thigh	Drumstick	Back	Neck	Wing	Abdominal fat	Giblet
Control	60.12±1.18	28.27±0.20	18.38±0.55	17.60±1.20	16.10±0.96	7.06±1.23	13.64±0.91	2.50±0.42	5.03±0.26
T-1	59.04±1.42	27.19±1.05	15.82±0.56	15.64±0.74	18.52±0.78	6.32±0.32	13.98±0.84	2.16±0.19	4.93±0.24
T-2	56.64±1.38	27.71±1.29	16.81±1.27	17.07±0.43	17.35±0.44	5.85±0.30	13.14±0.63	1.97±0.08	4.81±0.21
SEM	0.842	0.510	0.573	0.518	0.517	0.419	0.421	0.157	0.125
P-Value	0.247	0.748	0.191	0.317	0.162	0.557	0.767	0.429	0.825

SEM is standard error of difference between means values P value is probably significance value

The present findings are in agreement with Nguyen and Bunchasak (2005) reported that, dietary energy content did not alter carcass quality..Ngullie *et al.* (2007) conducted experiment to determine the optimum level of energy and protein for Satpuda desi birds suitable for backyard poultry farming and its effects on performance and carcass characteristics. The carcass yield was not affected significantly due to different dietary energy protein combinations in Satpuda desi birds.

In present experiment the different protein and energy level feed did not revealed any significant effect on carcass yield in Chaitanya birds.

4.4. Production Economics

The cost of production of Chaitanya birds rearing up to 9^{th} week of age on different dietary treatment groups was worked out by considering the prices of inputs prevalent in the local market. Input considered are the cost of day old chicks, price of feed, medicines, vaccines and other miscellaneous.. The details of the same is presented in Table 4.7.It was observed that the feed price per kg of feed for Control diet was- ₹ 28.00, T1- ₹ 32.00 and T2- ₹ 30.50.. The total cost of production (₹ /bird) for the group Control- 113.91, T1- 128.95 and T2- 122.52 was observed. By considering the local selling price of Chaitanya birds at ₹ 140 per kg on live body weight the net profit per bird were highest in control diet fed birds (₹ 30.71), followed by T2 and T1 diet fed birds.

In present experiment, the lowest cost of production was noticed in the birds fed on control diet composed of CP-20%, ME-2600 Kcal/kg, methionine-0.42% and lysine-0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine-0.34%, Lysine- 0.75% during finisher phase.

Table. 4.7. Cost of Production of Chaitanya birds from 0 to 9th weeks of age

Particulars	**Control**	**T1**	**T2**
Chick cost (₹)	22.00	22.00	22.00
Feed Cost (₹ /Kg)	28.00	32.00	30.50
Miscellaneous cost. Per bird (₹)	5.00	5.00	5.00
Total feed intake (g/b)	3104	3186	3132
Live body weight (g)	1033	1007	1024
FCR	3.00	3.16	3.05
Feed Cost (₹ /bird)	86.91	101.95	95.52
Production cost per bird (₹) Chick+Feed+Misc.	113.91	128.95	122.52
Prod cost per kg	110.27	128.05	119.64
Lifting rate (₹ /kg/LBW)	140.00	140.00	140.00
Price obtained per bird	144.62	140.98	143.36
Net Profit generated per bird ₹	30.71	12.03	20.84

It was concluded that, rearing of Chaitanya birds on control diet (CP-20%, ME-2600 Kcal/kg, methionine-0.42% and lysine-0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase) recorded best growth performance, generated higher profit and lowest production cost to achieve approx. one kg live body weight.

SUMMARY AND CONCLUSIONS

The present study was designed to know the "Protein and Energy requirements of improved native chicken (Chaitanya) to optimize the growth performance and economization of diet for meat purpose". The experiment was conducted at Poultry Research and Training Centre, Department of Poultry Science, Nagpur Veterinary College, MAFSU, Nagpur. The experiment was conducted by formulating different dietary treatments of protein and energy levels to evaluate the growth performance and economics of Chaitanya birds rearing..

Five hundred and forty day-old Chaitanya chicks were equally and randomly distributed in to three treatment groups. Each treatment was subjected to three replicates with sixty birds in each replicate. The birds were reared on deep litter system of management and all the groups were provided with similar environmental and managemental conditions throughout experimental period for nine weeks. For formulating the different diet the base of the nutrient requirement for improved native chicken was considered on the basis of data available in the book Nutrient requirements of poultry, published by Indian Council of Agriculture Research, New Delhi. The different dietary groups were offered diet containing CP- 20%, ME- 2600 Kcal/kg, methionine- 0.42%, lysine- 0.92% during starter phase while, CP-16%, ME-2600 Kcal/kg, methionine- 0.34%, lysine- 0.75% during finisher phase (control) and the treatment group T-1 were offered the diet containing CP-21%, ME- 2650 Kcal/kg, methionine-0.50%, lysine-1.10% during pre-starter phase and CP-18%, ME-2750Kcal/kg, methionine-0.48%, lysine-1.00% during starter phase while, during finisher phase CP-17%, ME-2850 Kcal/kg, methionine-0.46%, lysine-0.90% feed offered. The treatment group T-2 was offered containing CP-20%, ME- 2600 Kcal/kg, methionine-0.45%, lysine-1.00% during pre-starter phase and CP-17%, ME-2700Kcal/kg, methionine-0.40%, lysine-0.90% during starter phase while, during finisher phase CP-16%, ME-2800 Kcal/kg, methionine-0.35%, lysine-0.80%..The

experimental feed was prepared with mainly maize soya and other locally available ingredients,

The average weekly live body weight changes in Chaitanya birds fed different levels of protein and energy diet were (P>0.05) non-significant in all treatment groups. At the end of 9th week of age, the mean live body weight values were inclined towards higher side in Control group (CP-20%, ME-2600 Kcal/kg, methionine-0.42% and lysine-0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase) than the treatment diet fed birds. The average cumulative feed consumption at the end of 9th week were 3104.53 ± 110.39, 3187.20 ± 19.49 and 3132.56 ± 91.28 g/bird, for Control and treatment groups T-1 and T-2, respectively. There was non-significant (P>0.05) differences in cumulative feed intake per bird in all treatment groups. The average weekly cumulative feed conversion ratio in Chaitanya chickens at 9th week of age was 3.00 ± 0.13, 3.16 ± 0.03 and 3.05 ± 0.06 for Control, T-1 and T-2 groups respectively. The higher weekly cumulative feed conversion ratio recorded in Control diet may be attributed to the higher LBW and less feed consumption due to the energy and protein content of the feed and vice versa in treatment T1 and T2. It was concluded that the best feed efficiency was recorded in control group Chaitanya birds fed diet as per Nutrient requirement of Poultry by ICAR, New Delhi recommendations. The overall mortality percentage was 4.44, 3.33 and 4.44 % in control and treatment groups, T-1 and T-2 respectively. Overall mortality in all treatment groups from 1st day to 9th week's period was well within limit. The dietary energy and protein level had no significant effect on antibody titer response against Newcastle disease in Chaitanya birds at the age of marketing. Similarly, different diets did not revealed any significant effect on carcass yield in Chaitanya birds. Rearing of Chaitanya birds on control diet (CP-20%, ME-2600 Kcal/kg, methionine-0.42% and lysine-0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase) recorded best growth performance, lowest cost of production to gain approx one kg live body weight and higher profit.

Conclusions

Based on the above results, it can be concluded that rearing of Chaitanya birds on control diet (CP-20%, ME-2600 Kcal/kg, methionine-0.42% and lysine-0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine-0.75%during finisher phase) recorded best growth performance, lowest cost of production to gain approx one kg live body weight and higher profits. The Nutrient requirements of poultry, recommendations (published by Indian Council of Agriculture Research, New Delhi) can be followed to optimize the production performance of the Chaitanya birds.

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VITA

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THESIS ABSTRACT

a)	Title of the thesis	:	**"PROTEIN AND ENERGY REQUIREMENTS OF IMPROVED NATIVE CHICKEN (CHAITANYA) FOR OPTIMUM GROWTH PERFORMANCE AND ECONOMIZATION OF DIET FOR MEAT PURPOSE"**
b)	Full name of student	:	**VHANALE RUSHIKESH DATTATRAYA**
c)	Name and address of Major Advisor	:	**Dr. M. M. Kadam** Sectional head Department of Poultry Science, Nagpur Veterinary College, Nagpur
d)	Degree to be awarded	:	**Master of Veterinary Science**
e)	Year of award of degree	:	**2022**
f)	Major subject	:	**Poultry Science**
g)	Total number of pages in the thesis	:	**40**
h)	Number of words in the abstract	:	**300**
i)	Signature of Student	:	
j	Signature, Name and address of forwarding authority (HOD/SH)	:	**Dr. M.M. Kadam**

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ABSTRACT

The present experiment was conducted to study the Protein and energy requirements of improved native chicken (Chaitanya) for optimum growth performance and economization of diet for meat purpose on 540 Chaitanya chicken up to 9 weeks. The

birds were distributed into three treatment group's *viz*., control, T1 and T2 on the basis of equal body weight. The present experiment was carried out to investigate the protein and energy requirements of improved native chicken (Chaitanya) during starter phase (0-9 weeks) of production to optimize the growth performance, immune response and economics of production and meat quality parameter. The experiment conducted on five hundred and forty Chaitanya birds were divided into three treatment groups namely Control, T-1 and T-2 containing total 540 chicks. Each treatment group was sub-divided into three replicates. Each treatment group Control diet (CP- 20%, ME- 2600 Kcal/kg, Methionine- 0.42%, Lysine- 0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase) as basal diet, while other treatment groups formulated as T-1 (diet received CP- 21% , ME- 2650 Kcal/kg, Methionine- 0.50%, Lysine- 1.10% during pre-starter, CP- 18% , ME- 2750 Kcal/kg, Methionine- 0.48%, Lysine- 1.00% during starter and CP- 17%, ME-2850Kcal/kg, Methionine- 0.46%, Lysine- 0 .90% during finisher diet) and T-2 (diet received CP- 20% , ME- 2600 Kcal/kg, Methionine- 0.45%, Lysine- 1.00% during pre-starter, CP- 17% , ME- 2700 Kcal/kg, Methionine- 0.40%, Lysine-0.90% during starter and CP- 16%, ME-2800Kcal/kg, Methionine- 0.35%, Lysine- 0 .80% during finisher diet). The basal experimental diets were formulated for starter phase (0-9 weeks) containing maize-soya based mash diet. The diet was formulated on the basis of the nutrient requirement for poultry (Native cross birds) published by ICAR. The result indicated that mean live body weight treatment group Control recorded the significantly ($P<0.01$) higher live body weights as compared to T-1 and T-2 groups. At the end of experiment body weight revealed that treatment group Control received diets containing CP- 20%, ME- 2600 Kcal/kg, Methionine- 0.42%, Lysine- 0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase recorded highest live body weight as compared all other treatment groups. The average cumulative weekly feed intake of Chaitanya chicken at 9^{th} week of age was recorded significantly ($P<0.05$) highest in treatment group T-1 as compared to all other treatment groups. The cumulative feed conversion ratio showed non-significant ($P>0.05$) differences among all treatment groups from 2^{nd}

to 9th weeks of age. The mortality was within limit. The antibody titers against ND (log_2 values) at 3rd and 9th week of age in Chaitanya birds fed different levels of protein and energy diet were non-significant (P>0.05) in all treatment groups. However, numerically higher ND antibody titers were recorded in treatment groups Control and T-1 at 9th weeks of age. It was observed that the cost of production in treatment groups Control, T-1 and T-2 was (□/bird) 113.91, 128.95 and 122.52, respectively. Based on the results, it may be concluded that high energy and crude protein in starter diet gives better performances in term of average live body weight, weight gain, feed intake and feed conversion ratio in Chaitanya chickens up to 0-9th weeks of age. However, the overall results indicated that cost of production rupees per kg live weight was reduced as compared to treatment groups up to 9th week of Chaitanya chickens. Considering the overall performance it may be concluded that the rearing of Chaitanya chickens with maintaining CP- 20%, ME- 2600 Kcal/kg, Methionine- 0.42%, Lysine- 0.92% during starter phase while, CP-16%, ME- 2600 Kcal/kg, Methionine- 0.34%, Lysine- 0.75% during finisher phase improved growth performance, immune response and reduced cost of production from 0-9th week of age.

प्रबंध सारांश

अ.	प्रबंधाचे शर्षक	:	"सुधारीत देशी जातीच्या (चैतन्य) कोंबड्यांच्या मांसाच्या दृष्टीने, वाढीसाठी व योग्य अर्थशास्त्रासाठी आहारातील प्रथने व ऊर्जेची गरज ठरवणे"
ब.	वद्याथ्र्यांचे पुर्ण नाव	:	व्हनाळे ऋषकेश दत्तात्रय
क.	मार्गदर्शकाचे नाव आण पत्ता	:	डॉ. एम. एम. कदम वभाग प्रमुख, कुकुटपालनशास्त्र वभाग, नागपूर पशुवैद्यकीय महा वद्यालय नागपूर
ड.	प्रदान करण्यात येणारी पदवी	:	स्नातकोत्तर पदवी (एम. व्ही. एस. सी.)
इ.	पदवी प्रदान करण्याचे वर्ष	:	२०२२
फ.	मुख्य वषय	:	कुकुटपालनशास्त्र
ग.	प्रबंधातील एकूण पृष्ठे	:	४०
ह.	सारांशातील एकूण शब्द	:	३००
ई.	वद्याथ्र्यांची सही	:	
ज.	अग्रेषत करणाऱ्या अधकाऱ्याची सही, नांव आण पत्ता	:	डॉ. एम. एम. कदम

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<u>सारांश</u>

सुधारित देशी कोंबड्यांच्या (चैतन्य) आहारातील प्रथने आण ऊर्जेच्या प्रमाणाचे अभ्यास करण्यासाठी ५४० कोंबड्यांवर ९ आठवडे हा प्रयोग केला गेला. कोंबड्यांच्या

मांसाच्या दृष्टीने चांगल्या वाढीसाठी तसेच व्यवसायाचे अर्थशास्त्र अभ्यासणे हा प्रयोगाचा मुख्य उद्देश होता. कोंबड्यांना ३ गटांमध्ये अनुक्रमे, नियंत्रित गट, टी १ आण टी २ गटात वभागण्यात आले. पुढे प्रत्येक गट ३ उपगटात प्रत्येकी ६० पक्षी याप्रमाणे वभागला वभागला गेला. नियंत्रित गटातील कोंबड्यांच्या खाद्यात प्रथने- २०**%,** ऊर्जा - २६०० **Kcal/kg,** मे थओनाइन **-** ०.४२**%,** लाय सन- ०. ९२**%** स्टार्टर टप्प्यात आ ण प्रथने - १६**%,** ऊर्जा - २६०० **Kcal/kg,** मे थओनाइन - ०.३४**%,** लाय सन- ०.७५**%** फनिशर टप्प्यात, बेसल खाद्य म्हणून, तर इतर ट्रीटमेंट गट टी १ खाद्य तयार केले गेले (खाद्यात प्रथने - २१**%,** ऊर्जा - २६५० **Kcal/kg,** मे थओनाइन - ०.५०**%,**लाय सन - १. १०% प्री-स्टार्टर टप्प्यात, प्रथने - १८ **%,** ऊर्जा - २७५० **Kcal/kg,** मे थओनाइन - ०.४८**%,** लाय सन- १. ००% स्टार्टर टप्प्यात आ ण प्रथने - १७%, ऊर्जा -२८५०**Kcal/kg,** मे थओनाइन - ०.४६**%,** लाय सन- ०. ९०% फनिशर खाद्यादरम्यान) आ ण टी २ (खाद्यात प्रथने - २०%, ऊर्जा - २६०० **Kcal/kg,** मे थओनाइन - ०. ४५%, लाय सन- १. ००% प्री-स्टार्टरदरम्यान, प्रथने- १७%, ऊर्जा - २७०० **Kcal/kg,** मे थओनाइन - ०. ४०%, लाय सन- ०. ९०% स्टार्टरदरम्यान आ ण प्रथने - १६%, ऊर्जा -२८००**Kcal/kg,** मे थओनाइन - ०. ३५%, लाय सन- ०. ८०% फनिशर खाद्यादरम्यान). सदर प्रयोगात मका व सोयाबीन आधारित भुकटी खाद्य तयार करण्यात आले. आयसीएआर, न्यू दिल्ली प्रकाशत पोल्ट्री पुस्तकातील संदर्भानुसार नियंत्रित खाद्य तयार करण्यात आले. चैतन्य कोंबड्यांच्या सरासरी साप्ताहिक वजनात, आहारात ववध प्रमाणात दिलेल्या प्रथने प्रथने व ऊर्जेमुळे कोणताही लक्षणीय फरक आढळला नाही. प्रयोगाअंती नियंत्रित गटातील गटातील पक्षांचे वजन हे इतर ट्रीटमेंट गटांच्या वजनापेक्षा काही प्रमाणात अधक आढळले. पक्ष्यांच्या एकंदर खाद्य खाण्याच्या प्रमाणामध्ये कोणत्याही गटात लक्षणीय फरक आढळला नाही. सरासरी खाद्याच्या मांसाचे गुणोत्तर **(FCR)** नवव्या आठवड्याच्याशेवटी नियंत्रित, टी १ आण टी २ गटासाठी अनुक्रमे ३. ०० ± ०. १३, ३. १६ ± ०. ०३ आ ण ३. ०५ ± ०. ०६ होते. खाद्याचे मांसात रूपांतरण क्षमताही नियंत्रित चांगली आढळली, कारण खाद्यातील ऊर्जा व प्रथनांच्या प्रमाणामुळे कमी खाल्लेले खाद्य आण ट्रीटमेंट टी १ आण टी २ मध्ये ते याउलट आढळले. नियंत्रित गटातील कोंबड्यांमध्ये उत्तम खाद्याचे मांसात गुणोत्तर **(FCR)** आढळले, ज्यांच्या खाद्यात आयसीएआर, न्यू दिल्ली च्या शफारशीनुसार दिलेल्या पोषक मूल्यांचा समावेश केला

गेला. सर्व प्रयोगादरम्यान कोंबड्यांच्या मर्तुकी प्रमाण मर्यादित होते. चैतन्य पक्ष्यांमध्ये राणीखेत रोगावरुद्ध (**log** २ मूल्ये) प्रतीपंड टाइटर्स हे प्रथने आण ऊर्जेचे खाद्यामध्ये ववध स्तर असलेल्या सर्व गटांमध्ये कोणतेही लक्षणीय बदल आढळले नाहीत. प्रयोगात असे आढळून आले की नियंत्रित, टी १ आण टी २ गटांमध्ये प्रति पक्षी उत्पादन खर्च (₹/पक्षी) अनुक्रमे ११३.९१, १२८.९५ आ ण १२२.५२ इतका आढळला. वरील प्रयोगाच्या आधारे, असा निष्कर्ष काढता येतो की चैतन्य कोंबड्यांचे संगोपन करताना स्टार्टर टप्प्याच्या खाद्यात प्रथने- २०**%,** ऊर्जा - २६०० **Kcal/kg,** मे थओनाइन **- ०.४२%** आण लाय सन- ०.९२**%** तसेच फनिशर टप्प्याच्या खाद्यात प्रथने -१६**%,** ऊर्जा - २६०० **Kcal/kg,** मे थओनाइन **- ०.३४%** आण लाय सन- **०.७५%** या खाद्यासाठी लागणारे कमी खर्च, चांगली वाढ आण जास्त नफा आढळले. एक कलो जिवंत कोंबडयाच्या शरीराचे वजन वाढवण्यासाठी कमी खर्च, उत्पादनाची सर्वात कमी कंमत आण जास्त नफा नोंदवला. चैतन्य कोंबड्यांच्या योग्य वाढीसाठी व अधक नफा मळवण्यासाठी आयसीएआर, न्यू दिल्ली यांनी दिलेल्या शफारशीनुसार पोषक मूल्यांचा खाद्यात समावेश करावा.