EFFECT OF LOCAL FEED INGREDIENTS ON GROWTH RATE OF SAKINI CHICKENS IN BANKE DISTRICT, NEPAL

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ABSTRACT

The experiment was conducted in Poultry Development Farm, Khajura, Banke, Nepalfrom 23rd November 2020 to 1st March 2021 to study the growth performance of indigenous (Sakini) chicken fed with varied combinations of local ingredients such as Maize (M), Broken rice (BR) and Wheat (W) in diets. The treatments used were, commercial feed formulation (T1), 75% M (T2), 50% M + 25% BR (T3), 50% M + 25% W (T4) and 25% M + 25% BR + 25% W (T5). A completely randomized design (CRD) having five treatments with three replications and 14 weeks experiment from 6th week to 20th week were used for the study. In this experiment Benefit-Cost ratio of T5 is significantly higher (1.93±0.04) and T1 obtained lowest ratio (1.41±0.03); per unit cost of meat was significantly higher (NRs. 572.10±71.14) in T1 while lowest in T4 (NRs. 409.96±8.36); final body weight was recorded to be higher in T5 (1.74±0.04 kg) while lowest in T4 (1.59±0.13 kg); mean weight gain was higher in T5 (1.41±0.01 kg)and the lowest in T2 (1.30±0.02 kg); lowest FCR was obtained by T5 (4.17±0.15) and T1 (Control) obtained highest (4.61±0.11); weekly weight gain was observed highest in T5 (0.101±0.008 kg) while lowest in T2 and T4 (0.093±0.008 kg). According to above result of this study the experimental treatment T5 gave better result in terms of body weight, weight gain, FCR and B/C ratio and treatment T4 gave better result in terms of dressing percentage and per unit cost of meat production. From this study it was concluded that, the locally available feed ingredients can be used to prepare feed for indigenous chicken (Sakini) without affecting the growth and production performance to reduce feed cost.

Keywords: *B/C ratio, Body weight, FCR, Local feed, Sakini*

INTRODUCTION

Indigenous chicken are raised for both egg and meat production in various parts of the world irrespective of climate, traditions, life standard, or religions (Tadelle, 2003). They provixe an essential source of protein as egg and meat for rural poor farmers and also the income when needed for family needs (Ekue *et al*., 2002). It has various merits, as they are cheaplyreared as scavenging flocks feeding on local available material, household waste, need small shelter for night and their meat and egg tastes are performed over those of exotic chickens (Bhurtel, 1998; Dessie and Ogle, 2001; Roberts, 2004). The most important aspect of indigenous chicken is their ability to adopt harsh conditions, including disease resistance and ability to withsatand adverse climate. However, they exhibit slow growth rate and lower production of eggs . They have smaller body size and laysmaller eggs as compared

to improved poultry strains (Pedersen, 2002; Gondwe, 2004) but are popular for good broodiness and mothering ability (Bhurtel, 1998; Pokharel*et al*., 2012).

The Sakini breed is one of the most widely distributed indegeneous breeds in Nepal, accounting for almost 50% of total poultry population across the country (Neupane & Gorkhali, 2008; Country Report, 2014). This breed is highly adaptable thriving in both tropical to temperate regions. The sakini population remains stable and is not considered at risk from conservation point of view. Even though this local chicken has morphologic and genetic diversity. Thearey come in different colors ranging from white to dark black, with some birds displaying a mixed colors. In some cases, tufts of feathers are found in the front portion of the neck. According to climatic differences the colour of feathers tends to vary. Feather color can vary depending on climate for example: gray, cream and brownish-red.

Sakini chickens, predominantly found in the plain and temperate regions of Nepal, are well-adapted to their local environments. Their adaptability and productivity are influenced significantly by their nutrition. Proper nutrition is crucial for optimal growth, egg production, and overall health in poultry. This holds especially true for native breeds like Sakini, which have distinct physical characteristics such as single combs, white earlobes, and yellow shanks, along with variations like pea or rose combs. Ensuring adequate nutrition supports these genetic traits and performance outcomes.

The performance of poultry is highly dependent on the quality and balance of their feed. Cereal grains, a major component of poultry diets, provide the bulk of the energy required for their growth and productivity. Starch, the primary energy source in cereal grains, must be efficiently digested to meet their metabolic needs. Feed costs, which constitute 60-70% of total production expenses, represent the most significant challenge in poultry farming. This makes the selection of cost-effective and high-quality feed ingredients crucial for sustainable poultry production (Nolan et al., 2010).

Rural farmers and small scale poultry entrepreneurs even in recent times rear indigenous chickens as backyard and intensive farming which is important source of their cash generation. They are feeding commercial feed and also using different locally available feed materials like maize, wheat, rice, oilseed cakes,pulses etc. without efficient nutritive balance of ingredients as per chicken requirements.So their chickens are getting an unbalanced diet hence giving poor growth performance. That causes great influence on cost of production and economic return. So, this study has been done to obtain a better combination of locally available feed ingredients to be fed for comparatively better growth performance and to reduce the cost of production of indigenous sakini chicken.

MATERIALS AND METHODS

Experimental Site

This experiment was conducted in Poultry Development Farm, Khajura, Banke, under Ministry of Land Management, Agriculture and Co-operatives, Lumbini province, Nepal. Research was conducted for 14 weeks from 23rd November 2020 to 1st March 2021.

Sample collection

Firstly, initial weight was recorded and almost uniform and healthy 375 Sakini chicks were brooded for 6 weeks.

Experimental design

The experiment was carried out in a Completely Randomized Design (CRD) with three replications of five treatments and twenty-five birds were placed in a singlepen.

Experimental diets or treatments

There were total five experimental diets or treatments of this research. 25 parts of protein and mineral sources were kept similar for all treatments. They are:

First treatment (T1) = Control (Maize based formulation as PDF, Khajura)
Second treatment (T2) = 75 parts maize
Third treatment (T3) = 50 parts maize + 25 parts broken rice
Fourth treatment (T4) = 50 parts maize + 25 parts wheat
Fifth treatment (T5) = 25 parts maize + 25 parts broken rice + 25 parts wheat

Ingredients of experimental feed

Considering the energy and protein requirement of experimental chicks accordingto the nutritional recommendations of the NRC (1994) for growing dual purpose chicken. The feed which was applied in the treatment was formulated as following proportions.

Table 1: Experimental feed formulation

Ingredients	T 1	T 2	T 3	T 4	T 5
Maize	50	75	50	50	25
Rice Bran	11	0	0	0	0
D.O.C	5	0	0	0	0
Broken rice	0	0	25	0	25
Wheat	0	0	0	25	25
Molases	2.5	0	0	0	0
Soya	26.5	23.5	23.5	23.5	23.5
Sunflower cake	2.5	0	0	0	0
Bone & Meatmeal	1.5	0	0	0	0
DCP	1	1	1	1	1
Lysine	0.02	0	0	0	0
Methionine	0.01	0	0	0	0
Subtotal	99.53	99.50	99.50	99.50	99.50
Minerals,Vitamins & Others					
Mineral	0.10	0.10	0.10	0.10	0.10
Salt	0.04	0.04	0.04	0.04	0.04
Sodabicarb	0.01	0.01	0.01	0.01	0.01
Vitamin Mix	0.05	0.05	0.05	0.05	0.05
Liver Tonic	0.05	0.05	0.05	0.05	0.05
Toxin binder	0.05	0.05	0.05	0.05	0.05

Enzyme	0.05	0.05	0.05	0.05	0.05
Termeric Powder	0.10	0.10	0.10	0.10	0.10
Acidfier	0.05	0.05	0.05	0.05	0.05
Subtotal:	0.50	0.50	0.50	0.50	0.50
Total:	100.03	100.00	100.00	100.00	100.00

Column 2,3,4,5,6 indicates proportion of ingredients used in five experimental feed as % basis. DOC= de-oiled cake; DCP= Dicalcium Phosphate

Preparation of Feeds

Basic feed ingredients such as maize, broken rice, wheat and soybean oil cakes were used for feed diet. The other ingredients like minerals and vitamin premix were also used in the feed as a growth promoter. Before preparation of feed, all the ingredients were finely grinded in grinder mill and sieved thoroughly by 3.0 mm mesh sized sieve accordingly. Based on the energy and protein content of different ingredients, , the required quantity were calculated and throughly mixed to ensure homogenization. Five experimental diets were formulated for the study. The first diet served as the control consisting of maize based composition which was also used in poultry development farm, Khajura. Remaining four are combination of different combinations (Table 1). All feeds were prepared in the mash form and stored in dry place to prevent from fungal infections.

Data collection and entry

Data on feed intake were recorded daily basis while the weight of chicken was meaasured weekly. For determining the dressing percentage, at 20 weeks of age, all birds were weighed after six hour of feed fasting . Three birds per replicate were selected according to replicate to determine body composition.

Statistical analysis

Collected data were tabulated in MS Excel 2013 sheet and statistically analyzed by one-way ANOVA (Analysis of Variance) and repeated one way ANOVA for weekly analysis using R studio (Version 1.0.143). Duncan's Multiple Range Test (DMRT) was performed for mean comparison. Differences were considered significant at an alpha level of 0.05 and MS excel 2013 was applied to generate the graphical presentation.

RESULTS AND DISCUSSION

Experimented feed

The feed was maintained with 18-19% crude protein. During the preparation of experimental feed, four treatments except control were prepared with the local available energy source materials in different concentration levels. The provided feed was maintained within standard as per NRC recommendation.

The nutrient composition of experimental feed Table 2 was carefully formlated to meet NRC (1994) recommendations, ensuring that the physiological requirement of poultry was adequately addressed. Variation in nutrient composition from T1 to T5 reflects the use of locally available feed ingredients and adjustment in feed formulation.

Table 2: Calculated analysis of nutrient composition[1]

Nutrient	T1	T 2	T 3	T 4	T 5
ME (Kcal/kg)	2910.2	3020.6	3060.9	2948.1	3020
CP %	19.52	18.46	18.82	19.02	18.25
CF %	5.06	3.31	3.25	6.20	5.83
Ca%	0.95	0.41	0.26	0.97	0.67
Ph(a) %	1.08	0.52	0.53	1.16	0.86
Lysin	1.03	1.05	1.03	0.93	1.78
Methonine	0.45	0.44	0.48	0.43	0.81
Methionine + Cystine%	0.67	0.60	0.75	0.67	1.16
Arginine%	1.03	0.93	1.01	0.82	1.33
Tryptophane%	0.22	0.20	0.23	0.18	0.29
Threonine%	0.68	0.66	0.68	0.57	1.02
Isoleucine%	0.97	0.91	1.01	0.80	1.46
Valine%	0.87	0.77	0.84	0.72	1.44
Linoleic acid%	1.56	1.43	1.38	1.47	0.98

[1]Calculated analysis according to NRC (1994). Column 2,3,4,5,6 indicates nutrient composition of five experimental treatments. ME= Metabolizable energy; CP= Crude protein; CF= Crude fiber; Ph(a)= available phosphorus; Ca= calcium; Kcal/kg= kilocalorie per kilogram

Growth performance

The results for sampled chicken were obtain, including their mean weight, mean weightgain, mean feed intake and feed conversion ratio. These parameters along with total feed intake, final body weight, mean weight gain and feed conversion ratio are presented in table 3. Performance data on mortality and dressing percentage are presented in table 5 and weekly performance of chicken is presented in table 4. In the present study inclusion of local feed ingredients showed non-significant difference in growth performance as compared to control feed. Thegrowth performance obtained in this result is similar as Sethi *et al*. (2006) in quail.

Chicken growth performance in terms of Total feed intake, Final body weight, Mean weight gain and Feed conversion ratio

The total feed intake of control treatment (T1) was higher with 6.41±0.13 kg followed by T3 and T5 which obtained almost similar results as 5.89±0.17 kg and 5.89±0.15 kg respectively. The lowest total feed intake 5.59±0.12 kg was obtained by T2. Statement of Bhuiyan *et al*. (2013); Cancherini *et al*. (2008); Chen *et al*. (2020) in goose had also support this result.

The higher final body weight was obtained in T5 i.e. 1.74±0.04 kg followed by 1.64±0.02 kg (T1). T3 and T2 had almost similar result 1.62±0.15 kg and 1.62±0.03 kg respectively. Lowest final body weight was obtained in the T4. This result is also supported by Chen *et al*. (2020) in goose.

Table 3: Average Total feed intake, Final body weight, Mean weight gain and FCR of 7th to 20th week

Treatments	Parameters			
	Total Feed Intake (Kg)	Final Body Weight (Kg)	Mean Total Weight Gain (Kg)	FCR
T1(Control)	6.41±0.13	1.64±0.02	1.39 ±0.01	4.61±0.11
T2	5.59±0.12	1.62±0.03	1.30± 0.02	4.30± 0.17
T3	5.89±0.17	1.62±0.15	1.31± 0.15	4.60±0.46
T4	5.79±0.23	1.59±0.13	1.31±0.10	4.52±0.57
T5	5.89±0.15	1.74±0.04	1.41± 0.01	4.17± 0.15
CV %	4.67	7.68	7.62	11.36
P-value	>0.05	>0.05	>0.05	>0.05

Column 2,3,4,5 indicates the Mean±standard error of mean (SEM) of output of parameters. CV= Coefficient of variation; P value= Probability value; FCR= Feed conversion ratio

Similarly, mean weight gain was higher in T5 with 1.41±0.01 kg followed by 1.39±0.01 kg (T1). Treatment T3 and T4 obtained similar result as 1.31±0.15 kg and 1.31±0.10 kg respectively. The lowest mean weight gain was obtainedby T2 i.e. 1.30±0.02 kg. This result is similar as El-Katcha *et al*. (2014); Cancherini *et al*. (2008); Chen *et al*. (2020). The lowest FCR was obtained by T5 with 4.17±0.15 and T1 obtained highest 4.61±0.11 FCR. Similar non-significant result was also stated by Panwar *et al*. (2016); Cancherini *et al*. (2008); Chen *et al*. (2020) in goose.

Chicken growth performance in terms of feed intake and weight gain on weekly basis

Table 4: Growth performance of chicken in terms of Average weekly feed intake and weight gain (7th – 14th week).

Treatments	Parameters	
	Mean Weekly Feed Intake (Kg)	Mean Weekly Weight Gain (Kg)
T1(Control)	0.458±0.023	0.099±0.011
T2	0.400±0.024	0.093±0.008
T3	0.421±0.028	0.094±0.007
T4	0.414±0.027	0.093±0.008
T5	0.421±0.026	0.101±0.008
CV %	39.21	15.73
P-value	>0.05	>0.05

Column 2,3 indicates the Mean±standard error of mean (SEM) of weekly parameters. CV= Coefficient of variation; P value= Probability value

During experimental period the highest weekly feed intake of chicken was obtained in T1 (0.458±0.023) followed by T3, T5 & T4 respectively. The lowest weekly feed intake was observed in T2 (0.400±0.024). Similarly, the highest weekly weight gain was observed in T5 (0.101±0.008) which is followed by T1 & T3 respectively. Treatments T2 and T4 shows lowest weekly weight gain i.e. 0.093±0.008.

The higher CV was obtained in feed intake, this might be due to the mean was calculated for overall 14 weeks of age. According to NRC (1994), intake of feed during initial week

is less than the later weeks and obviously intake is highest in final weeks as their need for growth and development.

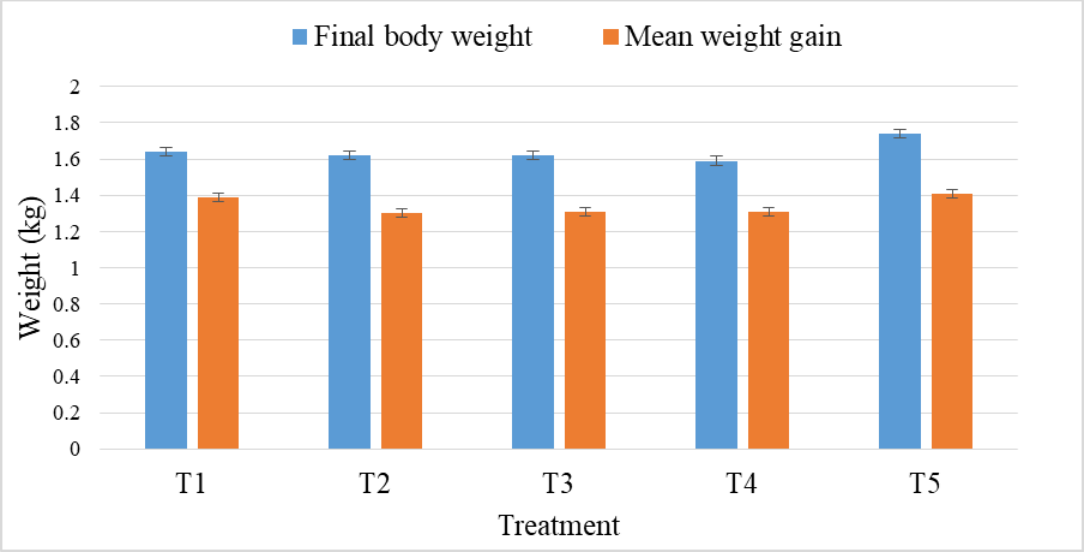

Figure 1: Comparison of Total feed intake, weight gain and FCR of five experimental treatments

In this study, the obtained results showed that, effect of inclusion of wheat and broken rice in substitution of maize based diet and total maize fed diet in Total feed intake, Final body weight, Mean weight gain and FCR were non significantly different. Which is presented in table 3 and figure 1. The obtained result was non-significantly different which might be due to the combination of all ingredients in different treatments were maintained in the way where the nutrition composition of diet were almost similar forall treatments and lies within the range of standard nutrition requirement of chicken.

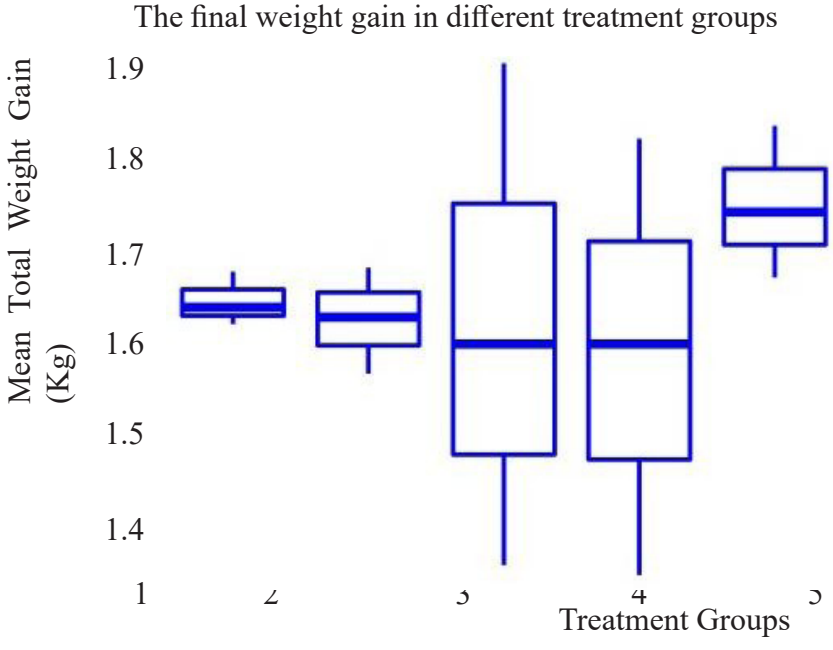

Figure 2: Box plot representation of chicken in different treatments

The box plot for mean weight gain of the chickens indicates that nearly all the chickens in treatments T1 and T2 showed a uniform weight gain. However, in treatments T3 and T4, the weight gain varied more widely, suggesting greater variability in growth among the chickens in these groups. In treatment T5, the chickens achieved the highest mean weight gain, with relatively more consistent results, as shown in Figure2.

Chicken growth performance in terms of Mortality and Dressing percentage

Table 5: Chicken growth performance in terms of Mortality and Dressing percentage

Treatments	Parameters	
	Mortality rate (%)	Dressing percentage (%)
T1(Control)	2.67±2.67	64.37±0.39
T2	1.33±1.33	62.63±0.50
T3	8.00±2.31	65.11±1.13
T4	6.67±2.67	66.60±1.12
T5	5.33±1.33	64.82±1.08
CV %	74.4	2.26
P-value	>0.05	>0.05

Column 2,3 indicates the output result of experiment with standard error of mean (SEM) in percentage. CV= Coefficient of variation; P value= Probability value; FCR= Feed conversion ratio

This result showed that the highest mortality rate in T3 (8.00±2.31) followed by T4 (6.67±2.67), T5 (5.33±1.33), T1 (2.67±2.67) respectively and lowest mortality rate was obtained in T2 (1.33±1.33). This result is also supported by Peng *et al*. (2003). The CV of mortality rate seemed to be higher which might be due to the environmental or managerial impact on mortality rate rather than treatment effects.

Dressing percentage of T4 was obtained highest (66.60±1.12) among the treatments and this result was followed by T3 (65.11±1.13), T5 (64.82±1.08), & T1 (64.37±0.39) respectively. The lowest dressing percentage was obtained in T2 (62.63±0.50). This result is also supported by the statement of Cancherini *et al*. (2008); Mammo and Sultan (2010) and Razuki *et al*. (2017).

Economic performance

Chicken economic performance in terms of B/C ratio and per unit cost of meat

The economic parameters of chicken reared under treatments are obtained, analyzed and tabulated below in terms of B/C ratio and per unit cost of meat production in table 6. In the present study the replacement of maize with wheat and broken rice showed significant difference in economic performance of chicken.

Benefit-Cost ratio of treatment T5 is significantly higher 1.93±0.04 followed by T2 (1.87±0.05), T3 (1.80±0.14) and T4 (1.79±0.17) respectively. Treatment T1 obtained lowest B/C ratio of 1.41±0.03.

Table 6: Benefit-cost ratio and per unit cost of meat production

	Parameters	
Treatments	**B/C ratio**	**Per unit cost of meat (NRs.)**
T1(Control)	1.41±0.03[b]	572.10±71.14[a]
T2	1.87±0.05[a]	429.65±19.41[b]
T3	1.80± 0.14[a]	426.06±6.50[b]
T4	1.79± 0.17[a]	409.96±8.36[b]
T5	1.93±0.04[a]	456.08±15.77[b]
CV %	8.31	9.15
P-value	0.0366 *	0.0412 *

Column 2,3 indicates the output result of experiment with standard error of mean (SEM). CV= Coefficient of variation; P value= Probability value; B/C= Benefit/Cost; Superscript a & b in data indicates significant comparison of mean. [a] indicates highest and [b] indicates the lowest value. * significant in P<0.05.

Similarly, treatment T1 resulted significantly higher per unit cost of meat (Rs. 572.10±71.14) followed by T5 (456.08±15.77), T2 (429.65±19.41) and T3 (426.06±6.50) respectively. Treatment T4 obtained lowest (409.96±8.36) per unit cost of meat production among all treatments. This result is similar as the statement given by Rama Rao *et al*. (2000); Swain *et al*. (2006).

CONCLUSION

From this study and obtained results it was concluded that, the locally available feed ingredients can be include to prepare feed for indigenous chicken (Sakini) without significantly (P<0.05) affecting the growth and production performance. From the result the experimental diet containing 25% maize, 25% wheat and 25% broken rice gave better result in terms of total body weight, weight gain and FCR. So, in conclusion, the treatment T5, which gave highest economic benefit was best feed combination to recommend for indigenous chicken *skaini* production in experimented location. Hence, according to this research; it seemed possible to replace commercial feed composition with local feed ingredients without affecting the growth performance. To overcome the high production cost of chicken in local level, we can replace the costly commercial feed with local available feed ingredients to help farmers for reduction of the cost of chicken production and increase the benefit.

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