A MULTIVARIATE PROFILE ANALYSIS OF EFFICACY OF TWO BREEDS OF POULRY BIRDS (BROILERS) FEEDING

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Abstract

The study aimed to examine the significant effect of two breeds poultry feeds with respect to weight performance in broiler birds. The experiment was conducted in the department of Agriculture Technology poultry farm (Agric.Garden), Kwara State Polytechnic, Ilorin. Nigeria from 15th march, 2016 to 16th may, 2016 (8 weeks). 150 broilers chick of a day old (DOC) were randomly allocated into two groups of 25 pens each consisting 3 chicken replicated and fed with feed (Breed A) and (Breed B) independently for the raised periods of 8 weeks. The reading on weights were recorded, the data source was mainly a primary data through the method of direct observation and measurement on weekly basis. A profile line graph exhibited a pattern of the broilers' weights Grain (BWG) regarding feeds intake. The Hoteling $T^2$and Wilk lamda (F-distribution) were employed to test for the parallel Profiles of the birds. The results revealed that the Broilers profile was not parallel. This is an indication that the level of the response on feeds (Breed A and Breed B) are not the same the the p-value<0.05. This suggested that there was significant weight gain on broilers fed with (Breed A), accounting for higher broilers' weights Grain (BWG).

Key words: poultry birds, readings, hotelling T^2, line graph, Wilk's lamda, Parallel, profiles, pens, lactobacillus sp.

1. Introduction

The interest in poultry and poultry products have grown tremendously faster in the last 20 years than in other food-producing animal industries having to do with how the bird products are produced, processed, consumed and marketed. Almost every country in the world has a poultry industry of some kind. The biggest challenge of commercial poultry production is the availability and sustainability of good quality feed at stable prices. In spite of this challenge, commercial poultry reveals that production ranks among the highest source of animal protein (Iyayi, 2008). (Mojtaba Yegani) Poultry meat and egg production have exhibited a considerable increase in Nigeria since 1970. The increase in the size of the poultry industry has been faster than other food-producing animal industries. Growth in livestock production in both developed and developing countries has been led by poultry. From the 1990s to 2005, consumption of poultry meat in developing countries increased by 35 million tons making it almost double the increase in developed countries. The trade volume of poultry products has also increased parallel to the rapid growth of global poultry meat and egg production. The increase in poultry meat consumption has been most evident in East and Southeast Asia and in Latin America, particularly in China and Brazil. The share of the world's poultry meat consumed in developing countries rose from 43 to 54 percent between 1990 and 2005, which accounted for 36 percent of the large net increase in meat consumption in developing countries over this period. Further, the proportion of the world's poultry meat produced in developing countries rose from 42 to 57 percent. It is estimated that production and consumption of poultry meat in developing countries will increase by 3.6 percent and 3.5 percent, respectively, per annum from 2005 to 2030 because of rising incomes, diversification of diets and expanding markets, particularly in Brazil, China and India. Poultry meat and egg production have shown a considerable increase since 1970. The increase in the size of the poultry industry has been faster than other food-producing animal industries. The trade volume of poultry products has also increased parallel to the rapid growth of global poultry meat and egg production. It seems that things have started to change. Feed prices, as the major expenditure of poultry production, are increasing. Disease outbreaks and related issues continue to cause significant economic losses in the industry. Nowadays, consumers are paying much more attention to quality and safety of poultry products. The trends described above imply that, our current knowledge of smallholder involvement raises a critical issue: for once, a sector in which the poor are heavily involved is growing. It shows that pork and poultry are the prominent growth sectors of developing country agriculture. If the poor fail to remain active in this sector, they will have missed a tremendous opportunity to improve their livelihoods. If they participate, farm income could rise dramatically; however, the conditions under which this could occur are unclear. Although the above-mentioned issues are real, it has also been suggested that the principal reason for the exit of smallholders from livestock production in developed countries is that they are not competitive with the larger operations that benefit from both technical and allocative economies of scale embodied in genetic improvement of animals and feeds or improved organization – especially in the case of poultry and pig production where profitable adoption simply requires larger farm sizes (Narrod, 1997; Martinez, 2002; Morrison Paul et al., 2004). This is a particularly difficult issue for smallholders, as it conveys a sense of inevitable economic doom propelled by irreversible technological progress. In Nigeria, various commercial feed mills are producing different forms of broiler feed for different age group of broilers. Broiler feed processing method that is employed by the feed manufactures to improve farm animal performance.

Poultry feeding is the conversion of feedstuff into human food. Some feeds is a form of a complete feed that is finely ground and mixed so that birds cannot easily separate out ingredients; each mouthful provides a well-balanced diet (Chehraghi, 2013). Poultry refers to domestic birds which are raised for meat fattening poultry include duck, fowl, turkey, geese, pigeon, etc and their products includes meat, egg, and in some cases feathers. The poultry industries in Nigeria contribute to the national economy and adequately supply needed protein for healthy wing. It serves as ready source of income to small scale farmers (Afolabi, 2002). Our interest in this research is to balance two kinds of poultry bird (Broiler) feeding. Poultry farming is one of the most lucrative business ventures one can embark upon if properly managed. The management of poultry aims at production of healthy and weighty birds in order to maximize profit. To actualize this, one has to adopt the best poultry birds feed on the birds. This work is aimed to use using Profile analysis in selecting the best feeds needed for the poultry birds. In this case, profile analysis could be described as a situation where a number of treatments are administered on two or more populations, Wald (1944), Leboeur and Carlotte (2000) stated that the responses must be expressed in similar unit and assumed to be independent of one another, for different populations.

The most consumed breed of chicken is popularly called Broilers which are bred specifically for food. However, the poultry industry in Nigeria has suffered a great deal of loss, which affects poultry farmers as well as consumers. Birds in general are prone to disease attack. A single attack can wipe out thousands of birds or even entire farm birds therefore some watchfulness accounts are required in feeds formulation. Feed ingredients for poultry diet are selected for the nutrient to be consumed by the poultry animal. The two breeds feeding formulae for this research are as follow for Broiler starter mixing in %

INGREDIENTS	**A(*Lactobacillus sp*)**	**B (Control)**
Yellow corn (grounded)	53.50	53.75
Soybean Meal	34.50	34.50
Copra meal/Fish Meal	08.00	8.00
Lactobacillus Sp.	00.25	00.00
Salt	00.25	00.25
Molasses	02.00	02.00
Vit./Min.Premix	00.50	00.50
Limestone	01.00	01.00
TOTAL	**100**	**100**

The two breeds feeding formulae considered this research are as follow for Broiler Finisher mixing in %

INGREDIENTS	**A(*Lactobacillus sp*)**	**B (Control)**
Yellow corn (grounded)	62.80	63.00
Soybean	34.40	33.40
Trace mineral	00.15	00.15
Lactobacillus Sp.	00.20	00.00

Salt	00.25	00.25
Molasses	02.00	02.00
Vit./Min.Premix	02.00	02.00
Limestone	01.20	01.20
TOTAL	**100**	**100**

Lactobacillus sp. is a genus of Gram-positive, facultative anaerobic or micro aerophilic, rod-shaped, non-spore-forming bacteria. Form a major part of the lactic acid bacteria group. The broilers (Birds) in both categories of feed were fed with *libitum* and clean water made available throughout 24 hours. Cheeke (1999) has suggested feed starter diet for three weeks. However, in this study, starter diet was fed for 28 days (4weeks) after which they were provided with mixture of starter and finisher in a ratio of 75% to 25% on 14 days (2weeks), 50% to 50% on 4 Days, 100% finisher by 7 Days were provided. The idea behind this approach was to minimize stress in growing chicks due to change in feed and to acclimatize them to finisher feed. Similar system of feeding regime was strictly followed in the groups of broilers farm. The feeders used were combination of trough type aluminum line feeders and round hanging type feeders. The equipment used for watering was plastic circular waverers and locally made earthen pot fountain drinkers. Care was taken to minimize the wastage of feeds.

There are numbers of factors (nutrient content, particle size, palatability etc) influencing growth rate of broiler birds. Studies have shown that broiler gained more weight with increased energy level and had significantly improved feed conversion. Protein deficiency in the feed results in poor feed consumption and loss of body weight in adult birds (Coon, 2001). Broilers are normally fed pelleted feed throughout the growing cycles (Lacy, 2001). Chicks are provided pelleted feed that has been crumbled so that it is in pieces small enough for the birds to consume easily. However, both Groups were in the form of crumbs and there was no trace of pellets. Physically, Group 1 contained Lactobacillus of 0.25 % both in Starter and Finisher Breeds while breeds for the Group 2 do not, it is clear that growth rate is better in Group 1 birds as compared to Group 2 birds.

According to Lacy (2001), birds reared up to 42 days grows rapidly from first few weeks of life, peak at 6-7 weeks of age, and then declines as they grow older (Figure 1). In contrary, this experiment showed gradual increase in weight gain and peaked at 4-7 weeks of age (Figure 3)

The actual live-weight gain (final live-weight – initial live-weight) in 41 days for each bird is 2.41 kg with daily weight gain of 58.76 gm. On the other hand, actual live-weight gain of each bird from (Breed A) is 2.14 kg with daily gain of 52.28 gm. This may be the fact that Lactobacillus sp. content in (Breed A). The growth curve generated in fig 3, fig.4 and fig.5 are very much in line with schematic representation of growth curves for broiler chickens suggested by Lesson & Summers (1991) as depicted.

2. Materials and Methods

Profile analysis, according to Ott, P., (1999), is a specific style of Multivariate Analysis of Variance. Tabacknick and Fidell had stated that Profile Analysis is equivalent to repeated measures, because of its multiple responses taken into sequence on the same subject(s). Rahman, H. Z and Hossain. M (1995) showed that an intervention with poultry production created a relatively small decline in the overall poverty with the proportion of extreme poor declining from 31 to 23% and the moderate poor stagnating around 29%. Rao C. Krishna (2005) recorded that poultry are inseparable from mankind and in the rural scenario they do not need any land, are easy to manage, regularly lay eggs, disease resistant and well adapted to the harsh environment. Croyles J. (2007) conducted a profile analysis on self-harm experience among Hispanic and white young adults. He compared the self-reported rates of self-harm in 255 Non - Hispanic white (NHW) and 187 Hispanic (predominantly Mexican American). He observed that self-harm is relatively common with about 31 % of the sample reporting some history of self-harm. Rates and specific types of self-harm did not significantly differ between the Non- Hispanic and Hispanic groups.

Dolberg (2003) reviewed poultry to be a tool in poverty alleviation focusing on experiences from Bangladesh but on survey and project work undertaken in India. Animal husbandry and agricultural departments' extension programmes are hardly known or used by most poor people for whom the poultry work is relevant. Most studies on Body Mass Index (BMI) were conducted in humans to measure obesity (Must *et al*., 1991; England *et al*., 2007). Obese studies are scant in livestock and poultry. However commercial broiler chickens have an increased growth rate but rapid growth associated with negative effects, including an increase in fat deposition (Griffin, 1996; Zerehdaran *et al*., 2004). Decreased fat content may be desired in meat products and this can be provided by decreased BMI. Excessive fattening is undesirable for both bird health and meat quality (Shahin and El Azeem, 2005, 2006). Feed restriction or similar stressful situations may make the BMI more acceptable for the health of consumers.

Wlks' Lamda Test statistic is a multivariate test statistical analysis of variance (MONOVA) to test whether there are differences between the means of identified groups.

The likelihood ratio test consist of

$$H_o : \mu_1 = \mu_2 = \mu_3 = \cdots = \mu_p , \lambda = \frac{|E|}{|E+H|},$$ the Wilks Lamda.

Reject $H_o \ if \ \lambda \leq \lambda_{\alpha,p,VH,VE}$

Note that rejection is for small value of λ. $Exact$ critical value is $\lambda_{\alpha,p,VH,VE}$, where $p =$ Number of variables (dimension), $VH =$ degree of freedom for hypothesis and $VE =$ degree of freedom for error.

Profile analysis is a multivariate technique for analyzing the shape (profile) of variables across groups i.e. it is the multivariate equivalent of repeated measures or mixed Anova. Profile analysis is a "true" multivariate approach which uses Separate correlated response variables (Rancher, 1995). The data are arranged in wide form. The response variable scales should be commensurate. MANOVA and MANOVATEST shall be used to perform profile analysis. One of the more popular designs encountered in the behavioral sciences and other fields are the two independent group profile design. The design is similar to the two-group location design used to compare an experimental and control group except that in a profile analysis p responses are now observed rather than p different variables. For these designs we are not only interested in testing that the means $\boldsymbol{\mu}_1$ and $\boldsymbol{\mu}_2$ are equal, but whether or not the group profiles for the two groups are parallel. To evaluate parallelism of profiles, group means for each variable are plotted to view the mean profiles. Profile analysis is similar to the two group repeated measures designs where observations are obtained over time; however, in repeated measures designs one is more interested in the growth rate of the profiles. For a profile analysis, we let $y'_{ij} = [y_{ij1}, y_{ij2}, \dots, y_{ijp}]$ represent the observation vector for i = 1, 2, groups and j = 1, 2, . . . , n_i observations within the i^{th}th group as shown in Table 3.1. The random observations $y_{ij} \sim IN_p(\mu_i, \Sigma)$ where $\mu_i = [\mu_{i1}, \mu_{i2}, \dots, \mu_{ip}]$ and $\Sigma_1 = \Sigma_2 = \Sigma$, a common covariance matrix with an undefined arbitrary structure.

TABLE 1: LAYOUT FOR TWO-GROUPS PROFILE ANALYSIS.

Group	Conditions					
	1		1	2	$\cdots$	p
1	y'_{11}	=	y_{111}	y_{112}	$\cdots$	y_{11p}
	y'_{21}	=	y_{121}	y_{122}	$\cdots$	y_{12p}
	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
	y'_{1n_1}	=	y_{1n_11}	y_{1n_12}	$\cdots$	y_{1n_1p}
Sum			$y_{1.1}$	$y_{1.2}$	$\cdots$	$y_{1.p}$
Mean			$\bar{y}_{1.1}$	$\bar{y}_{1.2}$		$\bar{y}_{1.p}$
2	y'_{21}	=	y_{211}	y_{212}	$\cdots$	y_{21p}
	y'_{22}	=	y_{221}	y_{222}	$\cdots$	y_{22p}
	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
	y'_{2n_1}	=	y_{2n_21}	y_{2n_22}	$\cdots$	y_{2n_2p}
Sum			$y_{2.1}$	$y_{2.2}$	$\cdots$	$y_{2.p}$
Mean			$\bar{y}_{2.1}$	$\bar{y}_{2.2}$		$\bar{y}_{2.p}$

While one may use Hotelling's T^2 statistic to perform tests, we use this simple design to introduce the multivariate regression (MR) model which is more convenient for extending the analysis to the more general multiple group situation.

The Multivariate Regression model for this design is

$$Y \quad = \quad X \quad . \quad B \qquad + \quad E$$

$$\underset{n\times p}{\begin{bmatrix} y'_{11} \\ y'_{12} \\ \vdots \\ y'_{1n_1} \\ y'_{21} \\ y'_{22} \\ \vdots \\ y'_{2n_2} \end{bmatrix}} = \underset{n\times 2}{\begin{bmatrix} 1 & 0 \\ 1 & 0 \\ & \vdots \\ 1 & 0 \\ 0 & 1 \\ 0 & 1 \\ & \vdots \\ 0 & 1 \end{bmatrix}} \underset{2\times p}{\begin{bmatrix} \mu_{11} & \mu_{12} & \cdots & \mu_{1p} \\ \mu_{21} & \mu_{22} & \cdots & \mu_{2p} \end{bmatrix}} + \underset{n\times p}{\begin{bmatrix} e'_{11} \\ e'_{12} \\ \vdots \\ e'_{1n_1} \\ e'_{21} \\ e'_{22} \\ \vdots \\ e'_{2n_2} \end{bmatrix}}$$

The primary hypotheses of interest in a profile analysis, where the "repeated," commensurate measures have no natural order, are

H_P : Are the profiles for the two groups parallel? Equivalently: is $H_{01}: \mu_{1i} - \mu_{1i-1} = \mu_{2i} - \mu_{2i-1}\ \ \forall i = 2,3,..,p$, assuming that the profiles are parallel.

H_C : Are there differences among conditions? Or are the profile level or Flat? That is all the means equal to the same constant? Equivalently: is $H_{03}: \mu_{11} = \mu_{12} = \cdots = \mu_{1p} = \mu_{21} = \mu_{22} = \cdots = \mu_{2p}$

H_G : Are there differences between groups? Or Are the profile coincidence? Equivalently: is $H_{02}: 1'\mu_{1i} = 1'\mu_{2i}$

The first hypothesis tested in this design is that of parallelism of profiles or the group-by condition (G × C) interaction hypothesis, H_P. The acceptance or rejection of this hypothesis will affect how H_C and H_G are tested. To aid in determining whether the parallelism hypothesis is satisfied, plots of the sample mean vector profiles for each group should be constructed. Parallelism exists for the two profiles if the slopes of each line segment formed from the p−1 slopes are the same for each group. That is, the test of parallelism of profiles in terms of the model parameters is

$$H_P \equiv H_{G\times C} : \begin{bmatrix} \mu_{11} - \mu_{12} \\ \mu_{12} - \mu_{13} \\ \vdots \\ \mu_{1(P-1)} - \mu_{1P} \end{bmatrix} = \begin{bmatrix} \mu_{11} - \mu_{12} \\ \mu_{12} - \mu_{13} \\ \vdots \\ \mu_{1(P-1)} - \mu_{1P} \end{bmatrix} \quad \text{------------------}(1)$$

Using the general linear model form of the hypothesis, **MBC** = **0**, the hypothesis becomes

$$\underset{1\times 2}{\mathbf{M}} \cdot \underset{2\times p}{\mathbf{B}} \cdot \underset{p\times(p-1)}{\mathbf{C}} = \mathbf{0}$$

$$[1 \quad -1]\begin{bmatrix} \mu_{11} & \mu_{12} & \cdots & \mu_{1p} \\ \mu_{21} & \mu_{22} & \cdots & \mu_{2p} \end{bmatrix}\begin{bmatrix} 1 & 0 & \cdots & 0 & 0 \\ -1 & 1 & \cdots & 0 & 0 \\ 0 & -1 & \cdots & 0 & 0 \\ \vdots & \vdots & \cdots & \vdots & \vdots \\ 0 & 0 & \cdots & 1 & 0 \\ 0 & 0 & \cdots & -1 & 1 \\ 0 & 0 & \cdots & 0 & -1 \end{bmatrix} = [0] \quad \text{--------------}(2)$$

Observe that the post matrix **C** is a contrast matrix having the same form as the test for differences in conditions for the one-sample profile analysis. Thus, the test of no interaction or parallelism has the equivalent form

$$H_P \equiv H_{G\times C} : \mu'_1 C = \mu'_2 C \text{-----------------}(3)$$

or

$$H_P : C'(\mu_1 - \mu_2) = 0$$

The test of parallelism is identical to testing that the transformed means are equal or that their transformed difference is zero. The matrix M in equation (2) is used to obtain the difference while the matrix C is used to obtain the transformed scores, operating on the "within" conditions dimension. To test eqn (3) using T^2, let

$\bar{y}'_{i.} = (\bar{y}_{i.1} \quad \bar{y}_{i.2} \quad \cdots \quad \bar{y}_{i.p}) \quad \forall i = 1,2.$

Then have

$C'(\mu_1 - \mu_2) \sim N_{p-1}[0, C'\sum C/(1/n_1+1/n_2)]$

So that under the null hypothesis,

$$T^2 = (C'\bar{y}_{1.} - C'\bar{y}_{2.})'\left[\left(\frac{1}{n_1}+\frac{1}{n_2}\right)C'S_{pl}C\right]^{-1}(C'\bar{y}_{1.} - C'\bar{y}_{2.})$$

$$= \left(\frac{n_1 n_2}{n_1+n_2}\right)(\bar{y}_{1.} - \bar{y}_{2.})'C(C'S_{pl}C)^{-1}C'(\bar{y}_{1.} - \bar{y}_{2.})$$

$\sim T^2_{(p-1,\, ve = n1 + n2 - 2)}$, where

$S_{pl} = [(n_1 - 1) S_1 + (n_2 - 1)S_2] / (n_1 + n_2 - 2);$

The estimate of $\sum$ obtained for the two-group location problem. S_i may be computed as

$$\sum = \begin{bmatrix} S_{i11} & S_{i12} & \cdots & S_{i1p} \\ S_{i21} & S_{i22} & \cdots & S_{i2p} \\ \vdots & \vdots & \vdots & \vdots \\ S_{ip1} & S_{ip2} & \cdots & S_{ipp} \end{bmatrix}$$

The hypothesis of parallelism or no interaction is rejected at the level α if

$$T^2 \geq T^2_{1-\alpha\ (p-1,\ n_1+n_2-2)}$$
$$= \frac{(n_1+n_2-2)(p-1)}{n_1+n_2-p} F^{1-\alpha}{}_{p-1,(n_1+n_2-2)}$$

Hotelling's T^2 statistic

$$T^2 = \left(\frac{n_1\, n_2}{n_1 + n_2}\right)(\bar{y}_{1.} - \bar{y}_{2.})' S_{pl}^{-1}(\bar{y}_{1.} - \bar{y}_{2.})$$
$$= \left(\frac{n_1\, n_2}{n_1 + n_2}\right) D^2$$

The test for differences in conditions when we do not have parallelism is

$$H_C^*: \begin{bmatrix} \mu_{11} \\ \mu_{21} \end{bmatrix} = \begin{bmatrix} \mu_{12} \\ \mu_{22} \end{bmatrix} = \cdots = \begin{bmatrix} \mu_{1p} \\ \mu_{2p} \end{bmatrix}$$

To test H_C^* using the MR model, the matrices for the hypothesis in the form **MBC** = **0** are

$$M = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \text{and} \quad C = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \\ -1 & -1 & \cdots & -1 \end{bmatrix}$$

for

$$\mathbf{H} = \left(M\hat{B}C\right)'\left[C(X'X)^{-1}C'\right]^{-1}(M\hat{B}C)$$
$$= \left(\frac{n_1 n_2}{n_1+n_2}\right) C'(\bar{y}_{1.} - \bar{y}_{2.})(\bar{y}_{1.} - \bar{y}_{2.})'$$
$$\mathbf{E} = C'Y(I_n - X(X'X)^{-1}X')YC$$

We can approximate the distribution of T_0^2 with

s = min (v_h, p −1 = min (2, p − 1), M = |p − 3|−1, and N = $(n_1 + n_2 - p - 2)$ /2

and relate the statistic to an F distribution with degrees of freedom v_1= 2 (2M + 3) and v_2= 2 (2N + 3). Alternatively, we may use Wilks' Λ criterion with

$$\Lambda = \frac{|E|}{|E+H|} \quad \sim \quad U(p-1, 2, n_1 + n_2 - 2)$$

or Roy's test criterion. However, these tests are no longer equivalent. The two-group T^2 test is thus a special case of MANOVA, There are four common test statistics; namely Wilk's Lambda (Λ), Pillai's Trace $V^{(s)}$, Hotelling-Lawley Trace $U^{(s)}$ and Roy's Greatest Root (θ). Relationship of these tests to two-sample Hotelling-T^2:, is

$$T^2 = (n_1 + n_2 - 2)\, \frac{1-\Lambda}{\Lambda}$$

$$= (n_1 + n_2 - 2)\, U^{(s)}$$

$$= (n_1 + n_2 - 2)\, \frac{V^{(s)}}{1- V}$$

$$= (n_1 + n_2 - 2)\, \frac{\theta}{1- \theta}$$

, using the definition with n ≡ ve = (n1 + n2 − 2) and p ≡ p − 1. Returning to the MR model representation for profile analysis, we have $\hat{B} = (X'X)^{-1}X'Y = \begin{bmatrix} \bar{y}_{1.1} & \bar{y}_{1.2} & \cdots & \bar{y}_{1.p} \\ \bar{y}_{2.1} & \bar{y}_{2.2} & \cdots & \bar{y}_{2.p} \end{bmatrix} = \begin{bmatrix} \bar{y}_{1.} \\ \bar{y}_{2.} \end{bmatrix}$, $\left(M\hat{B}C\right)' = C'(\bar{y}_{1.} - \bar{y}_{2.})$

Furthermore,

$$\mathbf{E} = C'Y(I_n - X(X'X)^{-1}X')YC$$

Or $$E = \begin{bmatrix} SSE_{11} & SPE_{12} & \cdots & SPE_{1p} \\ SPE_{21} & SSE_{22} & \cdots & SPE_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ SPE_{p1} & SPE_{p2} & \cdots & SSE_{pp} \end{bmatrix}$$

Or $$E = (n_1 + n_2 - 2)S_{pl}$$

, $n = n_1 + n_2$ and $q = r(\mathbf{X}) = 2$, $v_e = n_1 + n_2 - 2$. Further,

$$\mathbf{H} = \left(M\hat{B}C\right)'[C(X'X)^{-1}C']^{-1}(M\hat{B}C)$$

$$= \left(\frac{n_1 n_2}{n_1 + n_2}\right) C'(\bar{y}_{1.} - \bar{y}_{2.})(\bar{y}_{1.} - \bar{y}_{2.})'C$$

Or $$H = \begin{bmatrix} SSH_{11} & SPH_{12} & \cdots & SPH_{1p} \\ SPH_{21} & SSH_{22} & \cdots & SPH_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ SPH_{p1} & SPH_{p2} & \cdots & SSH_{pp} \end{bmatrix}$$

$$\psi = \mu_{1j} - \mu_{2j} - \mu_{1j'} + \mu_{2j'}$$

3. Data Presentation and Analysis

Table 1: The average weekly broilers weight gain (BWG) on chicken fed with breed A

(LACTOBACILLUS SP.)

Weeks	W1	W2	W3	W4	W5	W6	W7	W8	Grand Total	Grand Average
BTW/W	5.375	9.75	14.575	20.525	31.125	43.275	55.650	64.70	244.975	30.6219
BAW/W	.215	.390	.583	0.821	1.245	1.731	2.226	2.588	9.799	2.1776
BWG/W	……	.175	.193	.238	.424	0.486	0.495	0.362	1.908	0.302

Table 2: The average weekly broilers weight gain (BWG) chicken fed with breed B (WITHOUT LACTOBACILLUS SP.)

Weeks	W1	W2	W3	W4	W5	W6	W7	W8	Grand Total	Grand Average
BTW/W	5.375	8.750	14.075	20.025	26.125	33.025	40.150	47.70	195.35	33.41
BAW/W	.215	.350	.563	0.801	1.045	1.321	1.606	1.908	7.814	1.3364
BWG/W	…….	.135	.213	0.238	0.244	0.276	0.285	0.302	1.606	0.285

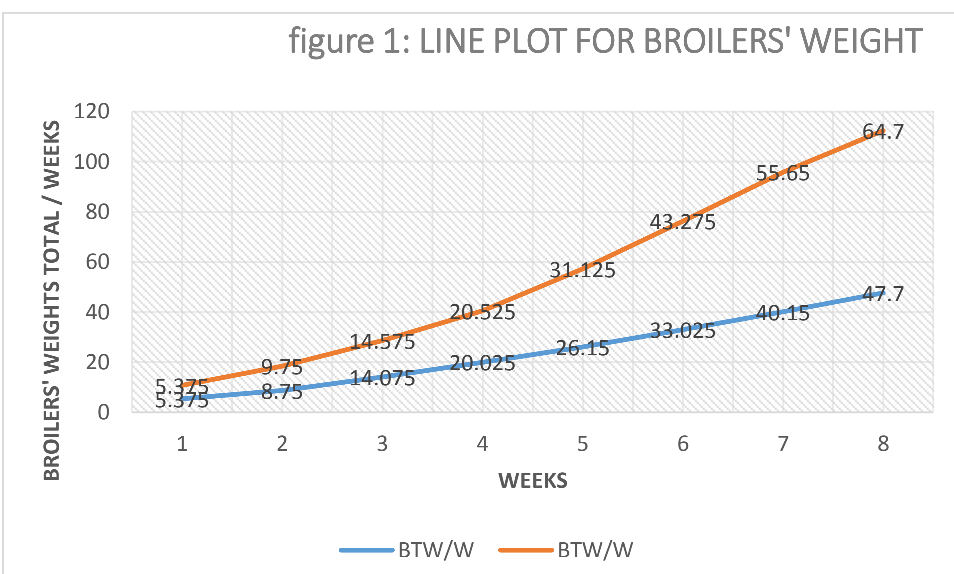


figure 2: A COMBINED LINES GRAPH ON BROILERS' WEIGHTS

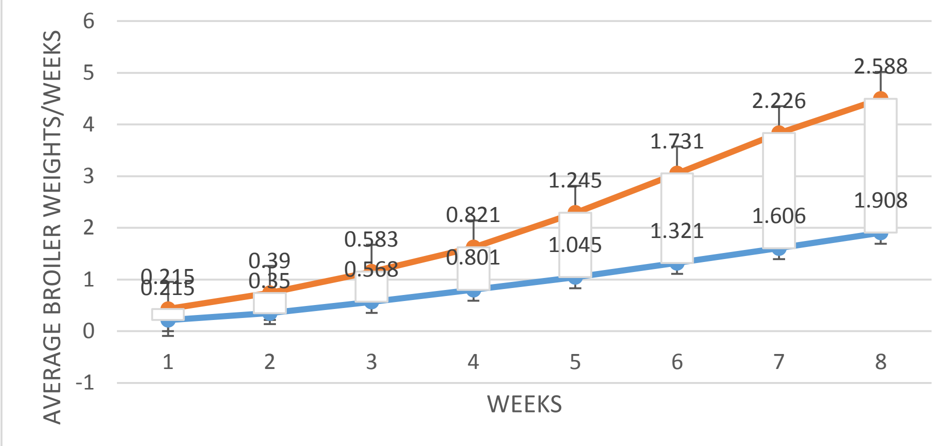
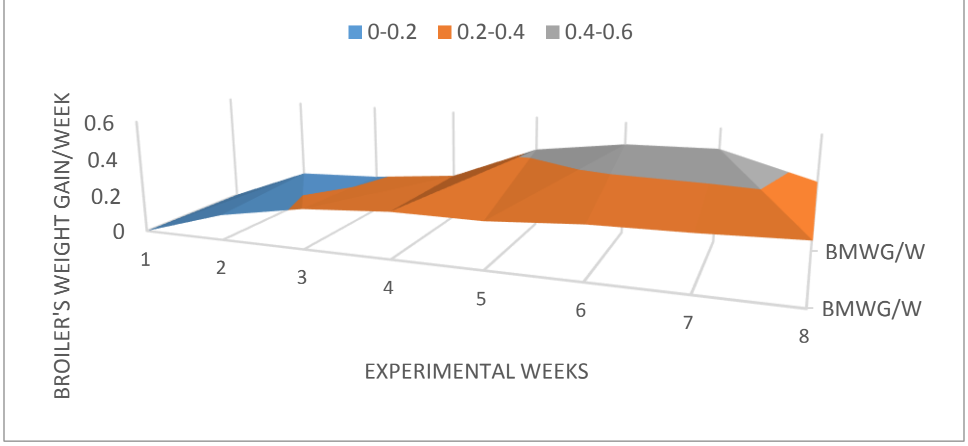


FIGURE 3: COMBINED SURFACE LINES GRAPH ON WEIGHTS GAINED



In this research work r-package computer software Version 3.3 is used to analyze the data. The statistical tools employed is profile plots and profile analysis.

Table 3 : Separated Statistical Analysis On Broilers' Weight Gain Profile

Hypothesis Tests:

Ho: Broilers' Profile are parallel vs H_1: Broilers' Profile are not parallel

Multivariate. Test	Statistic	Approx.F	Num.df	den.df	p.value

Wilks	0.6772595	4.1935	7	42	0.003339858**
Pillai	0.3227405	4.1842	7	42	0.003339858*
Hotelling-Lawley	0.4765388	4.1111	7	42	0.003339858*
Roy	0.4765388	4.0982	7	42	0.003339858*

Table 4: Test for Combined Broilers' Profile

Ho: Broilers' Profiles have equal levels vs H_1: Broilers' Profiles have unequal levels

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Group	1	2865	2865.2	6.712	0.0126 *
Residuals	48	20491	426.9	---	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Ho: Broilers' Profiles are flat vs H_1: Broilers' Profiles are not flat

F	df1	df2	p-value
1 466.3747	5	45	7.660691e-22*

4. Summary of Findings

In this research work, source of data collection is mainly primary source, extracted from the experimental unit of department of Agricultural technology, Kwara State Polytechnic, Ilorin. From the results obtained, it is obvious from fig.3, fig.4, and fig.5 respectively that Broilers' Average Weight Gain (BAWG per week) from Breed A exhibited more reasonable increments throughout the periods of the experiment.(8 weeks) than that of Breed B. Therefore, Feeding "Breed A" will yield more growth than feeding "B" to a reasonable level of weight even if the experiment is to be carry out more than 8 weeks. The analysis of the hypothesis 1 (parallelism) show that, there is significance in the feed (Breeds methods) and there is noticeable effect on the growth of broilers per week (since $p < 0.05$). Hypothesis 2 (between group effect) show that there is significant difference in the method of feeding (since $p < 0.05$). Hypothesis 3 show that there is significance different between the weights per weeks (since $p < 0.05$).

5. Conclusion

Base on the analysis and finding it was observed that ***Lactobacillus sp*** application to the feed as a supplement in the diets (mixture according to the level 0.2 in the study Breed A) enhances Broilers growth weight performances more favorably than when it was not applied on Breed B, It is also noted that for every weeks, the weight of broilers were tremendously increased up to the last week to account for the feeds importance. Based on the data available for this research work, we hereby recommend formulae feeding method with ***Lactobacillus sp.*** (Breed A) as better method of feeding (birds) broilers. That is, it is recommended that formulae feeding A is best for profitable rearing of livestock and is hereby recommended to the farmers. However, there are also need to investigate the exact amount of the supplement required for future practice by vary in the Lactobacillus sp levels for further experime

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