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COMPARATIVE ANALYSIS OF SEASONAL EFFECT ON SOME SELECTED STRAINS OF BROILER CHICKEN UNDER THE SAME DIETARY CONDITION

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Abstract

This research focused on the comparative analysis of six strains of broiler chicken under the same dietary treatment at Sini farms, Kaduna-Nigeria. The motive for embarking on such statistical analysis is to be able to give dependable information to broiler producers and public on the choice of broiler strains for table meat production. One hundred each of the broiler strains were raised at Sini Farms, Kaduna up to 8 weeks for both dry and raining seasons; and they were given the same feeds throughout the period of eight (8) weeks. At 8 weeks in each of the season, their weights were measured and the feed intakes were recorded. The mortality rates of each of the strains were also recorded and the analyses were carried out on the data. The Two-Samples Hoteling's T^2 Statistic was used to verify whether there are seasonal effects in the mean body weights and feed intake of the six strains of chicken. Also Two Way Multivariate Analyses of Variances (MANOVA) was used to verify whether there are seasonal effects on the Death/mortality rate of the six strains. The result of Hoteling's T^2 showed that there is no significant difference among the mean body weight of the six strains and the feed intake. Similarly, the result of the Two Way MANOVA shows that there is no significant difference in the mortality rate of the six stains of broiler stains, that is, the occurrence of death is independent of Strains but is dependent on the season which validates earlier believes and observations as quoted by Piejie et al (2012) "Chickling fear of cold and adult chicken hot afraid" We therefore, recommend that broiler producers and the general public should patronize especially any of the six strains of broiler and feed them properly. Also, commissioning of comprehensive programs, seminars and empowerment in Natural and Organic method of farming can contribute immensely to the GDP and help to reveal hidden facts and in turns generate employments and additional income to the populace.

Key Words: Seasonal Effect, Strains, Broiler Chicken, Dietary Condition, MANOVA, Hoteling's T^2

Introduction

Poultry referred to all kind of domestic birds kept for meat or egg purposes, they include chicken, birds, ducks, turkey, geese and guinea fowls. Poultry products are among the most valuables sources of animal proteins available for human consumption. These provide means of meeting the animal protein deficiencies, in many Africa countries demand for eggs and poultry meat out strip supply, as evidence by steep rises in price of poultry birds in the last sixteen years (Rouger *et al.*, 2017). There are reliable evidence that high infant mortality, low resistance to diseases, poor growth and development, mental retardation, kwashiorkor etc., are as a result of lack of suitable food containing protein of high quality which can be used to treat and prevent these conditions. At present, only a small proportion of the protein of the diet of an average Nigerian is derived from liver-stock production (Babale, 2019). Poultry has a short life cycle and is much prolific than large live-stock such as cattle, they are easy to rise and adapted to a wide range of climatic conditions (Nworgu, 2007). Nigeria poultry industries have over the years witnessed introduction of different broiler strains. The realization of full growth potentials of these imported strains is largely expected to depend on the nutritional and climatic variables, which is subject to genotypic traits, which in-turns set a ceiling on their production capacities. The implications are that broilers producers should select strain, which have the genetic potentials for fast growth rate under existing climatic conditions, [Hartcher and Lum, (2019)]. In addition, this industry provides the people with health security by supplying them with premium

quality of meat and eggs that can remove the malnutrition of the people and huge protein gap of the country; Nigeria as an emerging commercial venture in the world, is rapidly shaping-up into an attractive enterprise in response to the increasing demand of animal proteins (meat and eggs), which are required for alleviating the malnutrition problem among people. Despite the tremendous growth and development of modern broiler strains all over the world, the inability to determine the strains that have higher growth performance is still the main problem for the broiler producers. This problem is being aggravated by the introduction of different broiler strains and increasing trend of human population, and thus creating a heavy pressure on every form of food supply in Nigeria. The greatest scientific and technological development of poultry industry in the last few years demanded the evaluation of different commercial broiler strains, as well as differences in their weight in order to improve production efficiency, and help in proper decision-making at farming strategy for the commercial broiler producers. It is however, paramount to extend statistical methods and techniques to poultry production in Nigeria in order to compare and find out which of the strains with rapid growth that will be able to fill the gap for the demand of protein in the country. (Oke *et al.,* 2004). Poultry meat provides man with nutrient for growth, tissue replacement and weight control. Its usefulness in this respect is due to its low fat content. The mineral present in poultry meat include, sodium, iron, sulphur, calcium, phosphorous, chlorine. The level of meat and animal protein consumed by Nigeria is low, Nigeria consume about l0 grams per head per day. This is about 29% of the recommended amount of 35grams per head per day, (FAO, 1996). Thus there is need to increase animals and poultry meat production by making animals protein sources available and affordable to the Nigerians populace. Most of the birds belong to the three order of the avian class, the Galiforms, Anseniforms and Columbiforms. Majority of these species thrive well under a variety of Agro-Climatic Conditions and can be raised successfully almost at any place provided that certain minimum management and nutritional requirement are met, (Oluyemi and Robert, 2000). Birds are efficient converters of feeds into animal proteins when compared to other species of livestock, while chickens and ducks are used for commercial production of eggs and meats. Then turkeys, guinea fowl, etc., are used only for meat production, Sherman, (2008) and Abstracts-2011 (2011). Keeping poultry for eggs, raising broilers and fryers roasters for meat are the most common poultry enterprises in Nigeria. Others include basic breeds' farms for development of elite strains of layers and broilers. Some are commercial hatcheries for production and sale of day old commercial chicks. Allied professions include processing of eggs and meat marketing poultry and poultry products. Compounding and the sales of poultry feed, Pharmaceuticals feed additives are other allied professions (Sherman, 2008). Within the last one decade there had been intensified studies on the genetics, physiological, nutritional and growth performances of some imported hybrids or strains, such as Cob, Ross, Lehman, Hyper Com, Hubbard, Marshal, Arbor Acre, Anaks shal, etc. Most of these studies involved the comparisons of the responses of two or more broiler strains to the same level of physiological or nutritional treatment. This will furnish producers with dependable information in the choice of broiler strains for table meat production, Yahaya *et al.,* (2012). Body weight in poultry is one of the most economics traits which are influence not only by genetic make-up but only by environmental factor. It was further stressed that the weight of bird during growth period indicates their genetic rate of cell multiplication. Modern broilers are as a result of genetic selection with pressure being focused on high growth rate, extensive muscle development and relatively feed consumption. (Payne, 2001). Empirically, several studies have been conducted in this concept by many authors, among which are Abdullah, *et al.*, (2016) who compared the qualitative and quantitative properties of the wings,

necks and offal of chicken broilers from organic and conventional production systems, and they found out that there are no significant differences between the weights of organic and conventional live broilers. Tabinda *et al.,* (2013) conducted a comparative study of growth performance, meat quality and haematological parameters of three way crossbred chickens with reciprocal F1 crossbred chickens in a subtropical environment. The results revealed that the average day-old weight was highest in Rural Leghorn (RLH), intermediate in Fayoumi male_RIR female (FIRI) and lowest in RIR male_Fayoumi female (RIFI) chickens. The RLH and FIRI chickens consumed more feed and gained maximum (pB0.05) weight gain than that of RIFI crossbred chickens at all ages of the growing phase. Poor (pB0.05) feed conversion was observed in RIFI and better feed conversion was recorded in FIRI and RLH crossbred chickens. The RLH three-crossbred chickens had the lowest (pB0.05) mortality than two crossbred chickens. The highest dressing percentage was observed in FIRI (62.60) followed by RIFI (62.40%) and RLH (62.10%) chickens. The breast and thigh meat composition had non-significant (p_0.05) differences among all crossbred chickens. There were non-significant (p_0.05) differences in haematological values among all crossbred chickens. The total erythrocyte number, Hb and PCV increased with the advancement of age. However, ESR, MCV and MCH values decreased gradually with the advancement of age. They finally concluded that FIRI and RLH crossbred chickens gained better body weight than RIFI chickens with lower mortality. The three-way crossbred chickens of RLH showed better FCR and lower mortality than two-way reciprocal crossbred chickens of RIR and Fayoumi. Olawumi, *et al.,* (2011) studied the productive performance of three commercial broiler genotypes reared in the derived Savannah zone of Nigeria. It was observed that Marshall Breed recorded highest mean values and showed superiority over Arbor Acres and Hubbard in almost all the carcass traits considered. The former could be recommended to farmers as the choice breed with faster growth rate in terms of body weight at market age (8 weeks) and superior carcass characteristics**.**

Kalia, *et al.*, (2017), studied the growth performance of different broiler strains at high altitude and evaluation of probiotic effect on their survivability. The body weight gain and feed gain responses were significantly ($P < 0.05$) improved in RIR cross-bred. Mortality was also observed lower in RIR cross-bred. Thereafter, the second trial was conducted in RIR cross-bred to evaluate the effect of probiotic supplementation (T1 at 9 gm/kg feed, T2 at 18 gm/kg feed) on their performance and mortality. No significant differences ($P > 0.05$) were observed in weight gain, feed intake, and water intake among the three groups, however, mortality from ascites and coccidiosis was reduced in probiotic treated groups. Hence, the results suggest that RIR cross-bred is suitable for rearing in high altitude regions and probiotic supplementation has no beneficial effects on production performance of broilers at high altitude. However, probiotic supplementation indicated lesser loss due to mortality of birds. Udeh and Ogbu(2011) used Principal component analysis to study the body measurements in three strains of broiler chicken. The descriptive statistics of body weight and body measurements of the three strains of broiler chicken at 8 weeks of age showed that Arbor Acre and Ross attained average body weight of 1.88 kg and 1.81 kg respectively which were superior to Marshal (1.65kg) at 8 weeks of age. Arbor Acre was the most superior in drumstick length and wing length compared to Ross and Marshal Strains. The Ross strain was significantly ($p<0.05$) superior to Arbor Acre and Marshal Strain in body length while Marshal Strain recorded the highest breast width. The three strains of broilers did not differ ($p>0.05$) in shank length and body width. The coefficient of correlations of body weight and body measurements of the three strains of broiler chicken ranges -0.05-0.76, -0.02-0.56 and -0.28- 0.60 in Arbor Acre, Marshal and Ross strains respectively. The

relationships between body weight and most of the body measurements were positive and non-significant ($p>0.05$) in the three strains of broilers. Highly significant ($p<0.01$) positive correlations were recorded for shank length and breast width (0.62), thigh length and breast width (0.66), thigh length and wing length (0.64) and breast width and wing length (0.76) in Arbor Acre broiler. In Marshal, significant ($p<0.05$) positive relationships were obtained for shank length and body width (0.56), shank length and wing length (0.50) and body width and wing length (0.47).

Rosário, *et al.,* (2008) adopted the Canonical Discriminant analysis to study the broiler chicken performance, it was concluded that, Multivariate analysis based on the Canonical Discriminant analysis is suitable to evaluate broiler chicken performance because there was a reduction from six original traits to only two canonical variables. Average live weight and carcass weight were the most important traits to discriminate treatments, whereas the contrast between average feed intake and average live weight plus feed conversion were used to classify them. There was a clear distinction between strains, within sex, where Cobb 500 and AgRoss 308 presented the highest multivariate performance mean. Evaluation of broiler chicken performance was facilitated by the fact that the six original traits were reduced to only two canonical variables. Average live weight and carcass weight (first canonical variable) were the most important traits to discriminate treatments. The contrast between average feed intake and average live weight plus feed conversion (second canonical variable) were used to classify them. Peijie *et al.* (2012) studied the seasonal broiler growth performance prediction based on observational study. It was observed that feed conversion ratio and mean drug cost of broilers reach highest and lowest in summer and in winter respectively. That may be because high environmental temperatures depress food intake and body weight and also cause deterioration in the food conversion ratio. In conclusion, the approach validates some general concept of the experience from broiler farmers and industry experts. The phenomenon found supports the industry knowledge of "Chickling fear of cold and adult chicken hot afraid". It was further observed that the mean air temperature in chickling stage has greater influence to rate of sale than that of adult chicken stage, which validates that "higher mortality occurs in chickling stage than adult stage". This study is therefore aimed at comparing the growth characteristics of Arbor Acre, Lohmann, Hubbard, Marshall, Anaks and Ross broiler strains under the same dietary treatment with references to Sini farm, Kaduna. The general growth performances of Arbor Acre, Lohmann, Hubbard, Marshall, Anaks and Ross in terms of body weight, feed intakes and mortality rate per week in both raining and dry season is compared with the hope of making suggestions on the best choice of broiler strains for table meat production among the six Strains.

Materials and Methods

In this section, the methodology adopted in the research is described and discussed; the species involved were Hubbard, Arbor Acre, Marshall, Ross Lohman and Anaks. At the time of collecting the data, the birds were raised intensively for 8 weeks under a deep litter system in six different apartments for each broiler strains and they were fed with the same diet throughout the period of 8 weeks at Sini farms, Kaduna, Nigeria. A total of six hundred day old broiler chicks comprising of one hundred each of Arbor Acres, Hubbards, Marshall Ross, Lohman, and Anaks were first selected from the data and recorded. Also a total of 10 each of the selected strains were later selected at the second stage. The body weights, feed intakes and the mortality rate per week for both raining and dry seasons were gotten from the record office of the Farms. All the measurements were taken at eight week of age for all the broiler strains. Hence, the research is limited to Sini Farms situated in Mando area of Kaduna State, Nigeria.

Data Collection

The method which was used to collect the data is documentary method. Documentary method is a method of data collection which involved the extraction of data or information from already made available data either by published or unpublished data from official records, files, statistical publications, periodicals, journals, etc. This method has been employed because of lack of time and funds to conduct an experiment on the six strains of broiler chicken.

Statistical Tools

The statistical tools employed in this research are;

Hotelling's T^2– Test

The Hoteling'sT^2distribution is a multivariate statistical technique used for test of hypothesis concerning mean vectors. It is the multivariate equivalent of the t-test used in univariate test of hypothesis, Rencher, (2002). The two-sample Hoteling'sT^2 is the multivariate extension of the common two-group Student's *t*-test. This test is used when the numbers of response variables are two or more, although it can be used when there is only one response variable. The null hypothesis is that the group means for all response variables are equal. Hoteling's T^2 makes the usual assumptions of equal variances and normally distributed residuals, (Usman, 2015).

Equal Covariance Case

To demonstrate the Hoteling's T^2 statistic, a natural generalization of the squared distance in its multivariate analogue is given by:

$$T^2 = \frac{n_1 n_2}{n_1 + n_2}\left(\bar{\underset{\sim}{X}}_1 - \bar{\underset{\sim}{X}}_2\right)\mathbf{S}^{-1}\left(\bar{\underset{\sim}{X}}_1 - \bar{\underset{\sim}{X}}_2\right)' \quad (1)$$

where:

$\bar{\underset{\sim}{X}}_1$ and $\bar{\underset{\sim}{X}}_2$ are the two sample mean vectors, n_1 and n_2 are the two sample sizes, and $S^{-1}$is the inverse of the pooled covariance matrix which is calculated using;

$$\mathbf{S}_p = \frac{(n_1 - 1)\mathbf{S}_1 + (n_2 - 1)\mathbf{S}_2}{n_1 + n_2 - 2} = \mathbf{S} \quad (2)$$

and

$$\mathbf{S}^{-1} = \frac{1}{|\mathbf{S}|} Adj(\mathbf{S}) \quad (3)$$

The test Statistic for the Hoteling's T^2 is given as:

$$\gamma = \left(\frac{n_1 + n_2 - p - 1}{p}\right)\left(\frac{T^2}{n_1 + n_2 - 2}\right) \quad (4)$$

The (4) is known as two-sample Hoteling's T^2 distribution; if the observed T^2 is too large, the null hypothesis is rejected. Similarly, (4) can also be related to the F-distribution.

If $F_{a,p,(n_1+n_2-p-1)}$ denotes a random variable with an F-distribution with p and (n_1+n_2-p-1) degrees of freedom. Hence, reject H_0 in favour of H_1, at α level of significance if:

$$T^2 = \frac{n_1 n_2}{n_1+n_2}\left(\underset{\sim}{\bar{X}}_1 - \underset{\sim}{\bar{X}}_2\right)\mathbf{S}^{-1}\left(\underset{\sim}{\bar{X}}_1 - \underset{\sim}{\bar{X}}_2\right) > T^2_{\alpha,p,(n_1+n_2-2)} = \frac{(n_1+n_2-1)p}{(n_1+n_2-p-1)}F_{a,p,(n_1+n_2-p-1)} \quad (5)$$

Unequal Covariance Case

When the experimental setting or a preliminary test such as Box's *M* test leads to conclude that $\boldsymbol{\Sigma}_1 \neq \boldsymbol{\Sigma}_2$, an alternative to (1) must be used. Several such multivariate Behrens-Fisher tests have been suggested in statistical literatures. Following the suggestions of Rencher (2002) derived from a large simulation study, we use the procedure suggested by Timm (2002) since it was shown to have near optimal power while maintaining reasonable type-I error rates. The test statistic is computed using the formula

$$T^{*2} = \left(\underset{\sim}{\bar{Y}}_1 - \underset{\sim}{\bar{Y}}_2\right)'\left(\frac{\mathbf{S}_1}{n_1}+\frac{\mathbf{S}_2}{n_2}\right)^{-1}\left(\underset{\sim}{\bar{Y}}_1 - \underset{\sim}{\bar{Y}}_2\right) \quad (6)$$

T^{*2} is approximately distributed as $T^2_{p,v}$

where v is given by;

$$v = \frac{tr\left[\left(\frac{\mathbf{s}_1}{n_1}+\frac{\mathbf{s}_2}{n_2}\right)\left(\frac{\mathbf{s}_1}{n_1}+\frac{\mathbf{s}_2}{n_2}\right)\right]+\left[tr\left(\frac{\mathbf{s}_1}{n_1}+\frac{\mathbf{s}_2}{n_2}\right)\right]^2}{\frac{tr\left[\left(\frac{\mathbf{s}_1}{n_1}\right)\left(\frac{\mathbf{s}_1}{n_1}\right)'\right]+\left[tr\left(\frac{\mathbf{s}_1}{n_1}\right)\right]^2}{n_1-1}+\frac{tr\left[\left(\frac{\mathbf{s}_2}{n_2}\right)\left(\frac{\mathbf{s}_2}{n_2}\right)'\right]+\left[tr\left(\frac{\mathbf{s}_2}{n_2}\right)\right]^2}{n_2-1}} \quad (7)$$

Multivariate Analysis of Variance (Manova)

The MANOVA is an extension of ANOVA to the case where there are two or more response variables. In ANOVA, differences among various group means on a single-response variable are studied. In MANOVA, the number of response variables is increased to two or more. MANOVA is designed for the case where you have one or more independent factors (each with two or more levels) and two or more dependent variables. The hypothesis tests involve the comparison of vectors of the group means, (Usman, (2015)). The techniques are especially valuable when working with correlated variables. When only two groups are being compared, the results are identical to Hoteling's T^2 procedure. The multivariate extension of the F-test from ANOVA is not completely direct. Instead, several other test statistics are available in MANOVA: Wilks' Lambda, Hotelling-Laawley Trace, Pillai's Trace and Roy's-Largest root. The actual distributions of these test statistics are difficult to calculate, so we rely on approximations based on the F-distribution to calculate p-values.

MANOVA Model

Consider a simple random sample of size n from the i^{th}treatments of a multivariate normal population: $N_p(\boldsymbol{\mu}_i, \boldsymbol{\Sigma})$. The MANOVA model is:

$$X_{ij} = \boldsymbol{\mu} + \underset{\sim}{\alpha}_i + \underset{\sim}{\beta}_j + \underset{\sim}{\varepsilon}_{ij}, \quad \{^{i=1,2,\ldots,a}_{j=1,2,\ldots,b} \quad (8)$$

and

$$\varepsilon_{ij} \backsim N_p(0, \boldsymbol{\Sigma})$$

The sums of squares cross-product are:

$$\mathbf{T = SSCP_{Total}} = \sum_{j=1}^{k}\sum_{i=1}^{n} Y_{ij}Y'_{ij} - \overline{Y}_{..}\overline{Y'}_{..} \tag{9}$$

The sums of squares cross-product treatment

$$\mathbf{Q_1 = SSCP_A} = = \frac{1}{b}\sum_{i=1}^{a} Y_i Y'_{i.} - \overline{Y}_{..}\overline{Y'}_{..} \tag{10}$$

The sums of squares cross-product block

$$\mathbf{Q_2 = SSCP_B} = \frac{1}{a}\sum_{j=1}^{b} Y_j Y'_{j.} - \overline{Y}_{..}\overline{Y'}_{..} \tag{11}$$

$$\mathbf{E = SSCP_{Error} = T - Q_1 - Q_2} \tag{12}$$

Test Statistics

i. WILKS LAMBDA

$$\lambda_i = \frac{|\mathbf{E}|}{|\mathbf{Q}_i + \mathbf{E}|} \tag{13}$$

and for large sample, we reject H_o if

$$-\left((a-1)(b-1) - \frac{p+1-(a-1)}{2}\right)\ln \lambda_i \geq \chi^2_{\alpha,(a-1)p} \tag{14}$$

ii. HOTELLING LAWLEY's TRACE

$$T_o^2 = tr\left[\mathbf{TE}^{-1}\right] \tag{15}$$

the null hypothesis $H_o$is rejected if;

$$\left(\frac{r(m-p-1)+2}{r^2 b}\right) T_o^2 > F_{\alpha,br,r(m-p-1)+2} \tag{16}$$

iii. PILLAI'S TRACE

$$v = tr\left[\mathbf{T}\left[\mathbf{T}+\mathbf{E}\right]^{-1}\right] \tag{17}$$

the null hypothesis H_o is rejected if;

$$\left(\frac{m-p+r}{b}\right)\left(\frac{V}{r-V}\right) > F_{\alpha,br,(m-p+r)} \tag{18}$$

iv. ROY'S LARGETS ROOT

$$A = \mathbf{TE}^{-1} \tag{19}$$

the null hypothesis H_o is rejected if;

$$\left(\frac{n-b-1}{b}\right)A > F_{\alpha,b,(n-b-1)} \tag{20}$$

Assumptions and Limitation

The following assumptions are made when using a MANOVA.

1. The response variables are continuous
2. The residuals follow the multivariate normal probability distribution with means equal to zero
3. The variance-covariance matrices of each group of residuals are equal
4. The individuals are independence

Results and Discussion

Table 1: Hotelling's T^2

Hotelling's T2 Test Section

Covariance Assumption	T2	DF1	DF2	Parametric Test Prob Level	Randomization Test Prob Level
Equal	0.616	2	10.0	0.7643	0.7574
Unequal	0.616	2	9.1	0.7671	0.7574

The randomization test results are based on 10000 Monte Carlo samples

Based on the above Hoteling's T^2 Test, we do not reject the null hypothesis H_0 because we have no sufficient evidence to believe otherwise; since $T^2 > \alpha$- value that is $0.616 > 0.05$ hence, it is concluded that there is no significance difference in the seasonal performance of the six strains in terms of feed intake and body weight.

Table 2: Manova Test

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.921	510.890[b]	2.000	88.000	.000
	Wilks' Lambda	**.079**	**510.890[b]**	**2.000**	**88.000**	**.000**
	Hotelling's Trace	11.611	510.890[b]	2.000	88.000	.000
	Roy's Largest Root	11.611	510.890[b]	2.000	88.000	.000
SEASON	Pillai's Trace	.170	9.041[b]	2.000	88.000	.000
	Wilks' Lambda	**.430**	**9.041[b]**	**2.000**	**88.000**	**.000**
	Hotelling's Trace	.205	9.041[b]	2.000	88.000	.000
	Roy's Largest Root	.205	9.041[b]	2.000	88.000	.000
STRAINS	Pillai's Trace	.176	1.713	10.000	178.000	.081
	Wilks' Lambda	**.324**	**1.783[b]**	**10.000**	**176.000**	**.067**
	Hotelling's Trace	.213	1.852	10.000	174.000	.055
	Roy's Largest Root	.213	3.790[c]	5.000	89.000	.004

a. Design: Intercept + SEASON + STRAINS

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Since p-value < 0.005, that is 0.000 < 0.05, we reject the null hypothesis because the data provided sufficient evidence that supported the alternative hypothesis (H_1). We therefore conclude that there is significance difference in the mortality of the broiler chickens in the two

seasons (i. e. there is evidence of seasonal effect on the mortality rate). We further found that p-value (0.067) > 0.05, therefore the null hypothesis is not rejected because there is no evidence to believe otherwise. Hence, it is concluded that the strains is not causing the mortality in the farm.

Conclusion and Recommendation

The result in the Hoteling's T^2 showed that there is no significance difference in the seasonal performance of the six strains in terms of feed intake and body weight. This result also showed that chicken can be reared without chemical antibiotics and growth hormone that is, if the vaccines and the antibiotics are replaced with natural herbal supplement like Ginger Garlic Extract (GGE) and Probiotics Lactobacillus (LAB) can have similar behaviour and thereby will exhibit the same characteristics because of the effectiveness of the Lactobacillus and the GGE in feed conversion and resistance to diseases. This result is in contrary to Amao *et al,* (2011) which observed that there is significant difference in the feed conversion ratio of different broiler strains and this has effect on their weights as the chicken with higher feed conversion ratio possibly has a higher body weight than the strain with low feed conversion ratio.

The result in the MANOVA showed that the mortality of the broilers chickens does not dependent of strains but on seasons. Day Old Chicks (DOC) may likely die more during the raining season because they have no feather thereby exposing them to the cold weather condition resulting to death. Furthermore, adult chicks die less in the cold or raining season and die more in dry season because of the presence of feathers and making them prone to the harsh weather condition. The result validates some general concept of the experience from broiler farmers and industry experts as quoted by Piejie *et al,* (2012) that the phenomenon found supports the industry knowledge of "*Chickling fear of cold and adult chicken hot afraid*". The results obtained were of the believed that if proper bio-security is taken and the chickens are given feeds (Fermented Feed) at the same time and the same quantity, there is tendency that their body weight may be in response to their feed utilization and the mortality rate may be lowered. Thereafter, we recommend that broiler producers and the general public should patronize especially any of the six strains of broiler (Hubbard, Marshall, Anaks, Arbor Acre, Lohman Brown and Ross) and feed them properly. The broiler farmers should make the chicken house to be warmer during the raining season especially for baby chickens (DOC) and well ventilated during dry season for adult chicken. Also, commissioning of comprehensive programs, seminars and empowerment in natural and organic method of farming can contribute immensely to the GDP and help to reveal hidden facts and in turns generate employments and additional income to the populace.

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