WELFARE AND PERFORMANCEEVALUATION OF NOILER CHICKENS REARED UNDER DIFFERENT HOUSING TYPES

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ABSTRACT

The experiment was carried out at Department of Animal Science, Faculty of Agriculture, Federal University Dutsin-Ma Katsina State Nigeria to evaluate the welfare of Noiler Chickens raised under different housing types. A total number of one hundred and twenty (120) chickens were raised and used for this study and thereafter allotted to three (3) treatment for a period of 12 weeks. The treatments comprised of T1, T2 and T3 respectively. The result of growth performance of the Noiler birds indicated that initial body weight was similar (P>0.05) among all the treatments. Highest final body weight and body weight gain obtained in treatment 2 (1.71kg and 0.99kg respectively) which were significantly higher than those of treatment1 and treatment 3. There is no significant difference (P>0.05) between treatmen 1 and treatment 3 (Lablab purpureus) in terms of final body weight and body weight gain (T1: 1.64 & T3: 1.64). Data collected on welfare of Noiler using body condition scores, novel object and novel environment tests. All data collected were subjected to analysis of variance. The experiment lasted for a period of 12 weeks. The findings of the research indicated that comb pecking was higher for birds on treatment 3. However, toe damage and walking difficulties are highest for birds on treatment 1. The birds respond similarly to novel object placed in their pens except that at 180 seconds there were more birds around the object in treatment 1 housing compared to treatment 2 and treatment 3.

KEY WORDS

Novel object, welfare, fear, Housing, Noiler chickens.

1. INTRODUCTION

Changes in animal nutrition and management have been prompted by the growing focus on regulations in recent years. These changes are likely to continue, but more quickly, with significant pressure to adopt an environmentally and financially sustainable strategy (Olaniyi *et al.*, 2012). The housing arrangement, the feed the birds eat, the climate, and the management practices all have an impact on the performance of the poultry birds (Abeke *et al.*, 1998). According to Jibia (2021) and Suleiman, *et al.*, (2023), conventionally confined animals kept in a systems experience some levels of stress, which causes physiological and behavioral reactions. Systems of outdoor production, in which birds are not imprisoned, may reduce stress levels and enable the selection of strains that might improve comfort and welfare for birds. More so, compared to traditionally confined systems, the outdoor production approach enhances chicken flavor more effectively (Fanatico *et al.*, 2016; Latter-Dubois, 2000). Consumers are paying increasing attention to meat from poultry raised in low-input systems because they believe it is more sustainable and better for bird welfare, as a result of growing public concerns about animal

welfare (Erian 2017). For example, limiting stocking densities and flock size of a bird, housing systems and management practices in low-input systems strive to maximize the health and welfare of hens (Phillips 2017). Feather pecking is still a major challenges on free range farms, although being less common when the birds use the free range frequently (Bestman and Wagenaar, 2003; Bestman and Wagenaar, 2006). When birds are raised in the same facility, there is less stocking density, and premium litter is utilized, there is less feather pecking (Bestman and Wagenaar, 2003; Bestman and Wagenaar, 2006; Knierim *et al.,* 2008).

Evaluating the welfare of chicken flocks raised in various housing configurations is a challenging and occasionally contentious task. Regarding the definition of acceptable animal wellbeing, appropriate methods for assessing welfare, and how research findings should be interpreted, there are wide variations. Because management and nutrition differed across the many housing types used, comparing multiple housing types is challenging (Jacqueline, *et al.,* 2018). Reducing this chronic stress in animals is essential to improving their welfare. Animals, particularly those kept in free range systems, are frequently exposed to unfamiliar objects or predators, thieves and extreme or harsh environmental condition, or human interaction. They are also confined in small spaces, which may inhibit their natural instinct to flee.

Modern non-cage (free-range) or furnished cage systems (together referred to as "alternative housing systems") may, for example, limit behavioral expression and raise the danger of bone degeneration. In contrast, conventional caging systems may raise mortality, bone injury rates, and feather pecking (Lay *et al.*, 2011; Weeks *et al.,* 2017). As a result, a lot of research has been done on how birds behave and function in various housing systems as well as what changes in system management and design may be made to enhance the welfare of birds. The effects of the raising environment on the long-term behavior, health, and welfare of birds have garnered more attention in recent times. The perception of people towards birds' access to an outdoor area is good for welfare of the birds (Magdelaine *et al.,* 2008; De Jonge and Van Trijp, 2013; Howell *et al.,* 2016). Nevertheless, many researchers have argued that and are yet to confirm whether accessing an outdoor areas can affects the welfare of the birds. To this end, this study tends to evaluate the welfare and performance of Noiler chicken raised under different housing types.

2. METHODOLOGY

Experimental Site, Paddock establishment and sowing of *Lablab purpureus.*

The experiment was conducted at the late Prof. Abdu Lawal Saulawa Teaching and Research Farm, Federal University Dutsin-Ma, Katsina State. Dutsin-Ma is a local government area in Katsina State North-western Nigeria. It lies between latitude $12^0$26'00''N and longitude $007^0$29'00''E. The people are predominantly farmers, cattle rearers and traders (Baraya *et al.,* 2020). The mean annual Temperature ranges from 29°C-45°C. The region experienced the highest Air temperature which normally took place around April/May and the lowest occurs sometimes around December through the February (Abaje, *et al.,* 2014). The coldest month of a year is between January/February while the hottest month April while the vegetation of the area is the Sudan Savanna type which combines the characteristics and species of both the Guinea and Sahel Savanna (Liberty and Bello 2022).

Prior to the planting of the treated seeds of *Lablab purpureus* (Rongai white variety) which were obtained from the Pasture unit of the Livestock Teaching and Research Farm, Department of Animal Science Federal University Dutsin-Ma Katsina State. The land were wire fenced to avoid invaders from gaining access to the pasture area. The land was watered, harrowed and partitioned. The land were partitioned into 2 x 1.5m^2 in a row. A water channel/waterways were provided every two days interval to allow movement of water from the pumping

point/borehole/overhead tank to the prepared land. The water was directed to each portioned of the paddock until the portioned area was fully wets. And redirected to another portion of the paddock, until all the portioned areas were well watered. The seed was planted during the dry season from late December through March to April. 2 seeds per hole/stand were planted as the plants were legumes. An irrigation of water every two days interval were maintained to keep the soil moist and to help the seed under the soil wet for easy germination and to rupture the seed dormancy. After 3-5 days of planting, the seeds germinates. Compost manure was applied after some days of germination. After couple of weeks, the compost manure was added and weeds were handpicked. On the 5^{th} weeks of planting, then, the birds were introduced to the pasture area.

2.1. Experimental Animal, Design and Experimental Diet

One hundred and twenty-one 121-day-old Noiler chicks was allocated into the three treatments of the experiment which comprises of confined/deep litter (treatment 1), outdoor without access to pasture (treatment 2) and outdoor with access to pasture (treatment 3) in a completely randomized design (CRD) and replicated three times, each treatment consists of 20 chicks per replicate. At the end of the fourth week, the chicks were assigned to the experimental pens. Each experimental pen has an area of 1.5 x 2.0 m2 and was partitioned with approximately 2 x 6 wood shavings and wire mesh. The birds were provided with fresh, clean water and feed *ad libitum* throughout the experimentation periods. All managerial procedures were dully adhered. The treatments are Deep litter (T1), Outdoor access without Pasture (T2) and Outdoor access with Pasture (T3). Each treatment has three (3) replications of 20 birds each. Growth performance, welfare and the carcass quality of the birds were all determined according to Bokkers *et al.*, (2011). The experiment lasts for 12 weeks.

All the Noiler birds raised were given feed of the same nutrient and water *ad libitum*. The birds on free-range had access to *Lablab purpureus* (Hyacinth bean) at all the times while other group had no access to Lablab and commercially (experimental diet) prepared diet. The feeding program is highlighted below: ⎫ Starter diet 0-4 weeks ⎫ Chick mash 5-8 weeks 23 ⎫ Grower mash 9-12 weeks.

2.2. Measurements

this includes feed intake, body weight gain, feed conversion ratio, and Feed cost per kilogram gain.

2.3. Feed Intake and Body Weight Gain

The weighed feed was offered *ad libitum* to all the experimental birds. The leftovers of feed given were collected and weighed and the value recorded was subtracted from the initial feed given to ascertain the feed intake.
Feed intake (g) = feed given (g) - left-over feed (g)

The weight of birds in each replicate of the treatment was weighed at the beginning of the experiment and their weight was recorded, this is to prevent error and ensure that the same birds are weighed at all times. The weekly weight gain of the experimental bird was also recorded every week by subtracting the values of initial body weight in grams from final body weight as indicated.

2.4. Welfare Assessment

The welfare of Noiler chickens was assessed by assessing their body condition and exploratory status three days before the end of the experiment for plumage condition, comb pecking wounds, skin injuries, toe damage, eye pathologies, and footpad dermatitis and fearfulness. They were scored on a scale of 0 to 2, where "0" meant optimal condition, "1" minor negative deviation from the optimum condition, while "2" indicated major deviation from the optimum condition, as described in the Welfare Quality protocol (Butterworth *et al.*, 2009).

Table 1 Description of the welfare indicators derived from Welfare Quality–Poultry Protocol (Butterworth *et al.*, 2009).

Welfare indicator	Score	Description
Plumage condition	0	No or slight wear (nearly), complete feathering
	1	Moderate wear, this means damaged feathers or one or more featherless areas ,<5 cm in diameter
	2	At least one featherless area ≤5 cm in diameter
Comb pecking wounds	0	No evidence of pecking wounds
	1	Less than 3 pecking wounds
	2	Starting from 3 pecking wounds and more
Skin injuries	0	No lesions, only single (<3) pecks (punctiformdamage, < 0.5cm diameter) or scratches
	1	At least one lesion, <2 cm diameter at largest extent or ≤3 pecks or scratches
	2	At least one lesion _2 cm diameter at largest extent
Toe damage	0	No toe damage
	1	Wounds on one toe or missing (parts of) one toe
	2	Wounds on one or more toes and/or missing (parts of) one or more toes
Walking difficulty	0	Normal, dextrous, and agile
	1	Slight abnormality, but difficult to define
	2	Definite and identifiable abnormality Obvious abnormality, affects ability to move severe abnormality, only takes a few steps incapable of walking
Eye pathologies	0	No eye pathologies
	1	Swelling of the eyelids and the skin around the eyes
	2	Closure of the eye/eyes and discharge from the eyes

During the novel object test (NO), a bowl wrapped with foil paper was placed on the floor. It was positioned 5 inches away from the observer and the chickens were observed for 3 minutes. The first bird's latency to approach the object within 25cm and the first bird's latency to touch the object were recorded. Additionally, the number of birds within a 25cm radius of the novel object was counted every 30 seconds. This test followed the protocol developed by De-Heas et al. (2014). Two chickens from each replicate were used in the test. They were placed in a non-transparent black round bucket of about 35 liters and their responses were recorded for 2 minutes.

2.5. Statistical Analyses

All the data from the experiments was analyzed using Analysis of Variance (ANOVA) in Systat software (SAS Institute 2003). Significant ($P<0.05$) different means was separated using Duncan's Multiple Range Test (DMRT) as contained in SAS (1999) package. The performance and welfare of Noiler chickens raised under different housing types were regressed against the weeks of production (SAS, 1999).

3. RESULT AND DISCUSSION

3.1. Performance Characteristics

The result of growth performance of birds as shown in table 2 indicated that initial body weight was similar (P>0.05) among all the treatments. Highest final body weight and body weight gain obtained in T2 (1.71kg and 0.99kg respectively) which were significantly higher than those of T1 and T3. There is no significant difference (P>0.05) between T1 and T3 (*Lablab purpureus*) in terms of final body weight and body weight gain (T1: 1.64 & T3: 1.64).

Table 2: Growth Performance of Noiler chickens Reared under different housing types

Parameters	**T1)**	**T2)**	**T3)**	**SEM**
Initial Body Weight (kg/bird)	0.74	0.71	0.73	0.01
Final Body Weight (kg/bird)	1.64^{b}	1.71^{a}	1.64^{b}	0.01
Weight Gain (kg)	0.91^{b}	0.99^{a}	0.91^{b}	0.02
Total Feed Intake (kg)	4.42	4.52	4.41	0.06
Feed Conversion Ratio	4.89^{a}	4.53^{b}	4.86^{a}	0.08
Feed Cost/kg gain (N)	1095.20^{a}	1013.78^{b}	1087.62^{a}	17.93

$^{a\text{-}b}$ means within rows bearing differentsuperscripts differs significantly at $p > 0.05$. SEM = Standard Error of Mean

Santos *et al.* (2005) found that birds in semi-confined environments had better body weight gains due to enhanced comfort and welfare. However, the study by Ward *et al*. (2001) contradicted these findings by reporting that 40-day-old Ross pullets kept indoors were significantly heavier than free-range birds of the same age. On the other hand, Jiang *et al.* (2011) and Chen *et al.* (2013) established that there were no significant differences in the performance of Noiler chickens reared with outdoor access.

Some researchers also noted that outdoor access, particularly when more frequent and further away from the shed, led to a decline in the body weight of broilers (Polowicz and Doktor, 2011; Taylor *et al.*, 2020). This is consistent with the observations of Castellini *et al*. (2002), who reported that having outdoor access reduced the growth rate compared to conventional housing. Oyegunle *et al*. (2021) supported the findings of the present study, noting that the consumption of legume pastures improved the final body weight of broiler chickens, particularly those that had access to Stylosanthe shamata. Stylo was reported to have been used to improve the nutritive value of natural grasslands (Cook *et al.*, 2005; Partridge, 2003).

Furthermore, Ponte *et al*. (2008) reported that outdoor-raised birds with access to pasture had higher body weights when compared with birds without access to pastures. Oke *et al*. (2016) also indicated that access to legume pasture tends to improve the performance of hens. Additionally, according to Pavlovski *et al*. (2009), chickens reared indoors achieved considerably higher body weight compared to free-range chickens.

Oke *et al*. (2015) reported that the free-range housing system had no detrimental effect on the body weight of pullets up to the point of lay compared to the conventional housing system. They also noted that the weights of the hens in the deep litter were higher than those in the free range at 14 weeks in lay, attributing the lower body weight recorded in the free range to higher activities by the hens on the outdoor pasture.

There is no significant differences in terms of total feed intake (TFI) among all the treatments. Knight *et al.* (2018) found that the assumption that feed intake would be slightly higher on a legume-based pasture would most likely make no significant difference. This aligns with Oyegunle *et al*. (2021), who reported that farmers often assume that poultry raised on pasture will consume less feed over their production cycle compared with confined-raised poultry due to foraging for grass and insects. However, this assumption may not be scientifically justifiable because animals have higher energy demands when living outside due to the process known as homeostasis. They spend more energy walking around and using energy to stay warm/cool.

The low feed intake of birds in pasture areas showed that the feed intake of the birds on pasture is being controlled by their body requirements (Olajide *et al.,* 2013). The birds' growth performance index reported corroborates with the findings of Bockish *et al*. (1999), who stated that stress factors such as sun radiation, temperature, relative humidity, and indoor and grass paddock are important environmental indices responsible for animal performance. Gordon and Charles (2002) published that temperature, photoperiod, and adverse weather conditions have the potential to influence growth mainly by affecting the feed intake of indoor and outdoor birds.

Knight *et al.* (2018) also stated that generally speaking, livestock tend to trample as much forage as they consume. However, most livestock have anatomy conducive to digesting cellulose, like ruminants or horses. Chickens are not able to digest cellulose, so they probably consume an even smaller percentage of forage than ruminants or horses. The result of this study shows that there are no significant (P > 0.05) differences in FCR and FC between T1 and T3. On the contrary, Oke *et al.,* (2015) reported that the feed conversion ratio was better on the pastures than in the deep litter system, but this did not translate into higher body weight, possibly being used for other activities.

Table 3: Welfare parameters of Noiler chickens raised under different housing types

Parameters	**T1)**	**T2)**	**T3)**	**SEM**
Comb pecking	0.00^{b}	0.13^{b}	2.00^{a}	0.46
Skin injury	0.75	0.00	0.25	0.27
Eye pathology	0.00	0.00	0.00	0.00
Toe damage	0.25^{a}	0.00^{b}	0.00^{b}	0.07
Walking difficulties	0.25^{a}	0.00^{b}	0.00^{b}	0.07
Plumage condition	0.00	0.00	0.13	0.08

$^{a-b}$ means within rows bearing differentsuperscripts differs significantly at $p < 0.05$;
SEM: Standard error of means

From table 3, T1 and T3 has (0.00% & 2.00%) comb pecking. This shows that there is significant difference (P>0.05) between T1 and T3. From this finding, it shows that pasture contributes significantly on comb pecking. This result contradicts that of Bari *et al.* (2020) who found a positive correlation between comb pecking wounds and walking difficulty. This result could imply that comb pecks are aimed at those who are weaker than others-both socially and physically.

Furthermore, harmful pecking can also be done to the skin (Riber, *et al.,* 2018). Despite the fact the birds in this study had untrimmed beaks, there were very few skin injuries, eye pathologies and plumage damage case. When it comes to skin injuries, eye pathology and plumage condition, there is no significant difference (P > 0.05). This finding is consistent with the findings of (Baracho *et al.,* 2012; and Taylor *et al.* 2020) who found a negative correlation between walking difficulties and outdoor use as well as a relationship between toe damage and an imbalance

resulting in trouble walking, decreased mobility, and fewer opportunities to obtain resources. This result contradicts the findings of (Johns en *et al.,* 1998; Bestman *et al.,* 2009 & Tahamtani *et al.* 2016) who found that, while housing conditions during lay do play a significant role in plumage damage in adult birds, there is an increased risk of damage during the first four weeks of life when there is no litter substrate.

Table 4: Novel Object Test (NOT) assessment of Noiler chickens raised under different housing types.

Duration	**T1)**	**T2)**	**T3)**	**SEM**
30 seconds (number of birds)	5.75	6.63	6.88	0.69
60 seconds (number of birds)	6.75	7.88	8.38	0.82
90 seconds (number of birds)	7.75	6.63	8.38	0.53
120 seconds (number of birds)	8.75	6.50	8.38	0.76
150 seconds (number of birds)	9.25	6.50	6.13	1.01
180 seconds (number of birds)	11.00^{a}	6.50^{b}	6.63^{b}	0.96
first approach (s)	37.50	51.75	43.13	11.28

$^{a-b}$ means within rows bearing differentsuperscripts differs significantly at $p < 0.05$; SEM: Standard error of means

Table 4 indicates that there are no significant differences between T1, T2 and T3 in 30, 60, 90, 120, and 150 seconds respectively. With regards to 180 seconds, T1 has the highest scores (11.00) while T2 and T3 has the lower scores (6.50 & 6.63), the result showed that there is significant difference between T1, T2 and T3. This means that the birds get more at ease with the new thing the longer they use it, and vice versa. Compared to chickens raised in cages, young adults raised in more complex aviary habitats showed greater interest in unfamiliar objects (Bari, *et al.,* 2021).

Table 5: Novel Environment Test (NET) assessment of Noiler chickens raised under different housing types.

Parameters	**T1)**	**T2)**	**T3)**	**SEM**
first vocalization (s)	28.67	22.00	13.00	12.15
number of vocalizations (number of birds)	7.67	3.20	6.00	2.23
first flight attempt (s)	21.33	42.60	30.60	17.37
number of flight attempts (number of birds)	0.00	0.00	0.00	0.00

$^{a-b}$ means within rows bearing differentsuperscripts differs significantly at $p < 0.05$; SEM: Standard error of means

From table 5, the result shows that there is no significant difference between T1, T2 and T3 in terms of first to vocalize, number of vocalizations, first flight attempt and number of flight attempts. The birds' need for social reinstatement with conspecifics and their drive to evade researcher detection are both impacted by the NE (i.e., vocalizations). A low vocalization frequency on the NE test has been linked to a high fear threshold. But the two main elements of the NE test scenario that frighten hens are the feeling of being apprehended by a possible predator (a human observer) and the abrupt social isolation in a strange place (Suarez, Gallup, 1983). Therefore, reactions like vocalizations or attempts to flee can be seen as an interaction or a compromise between, on the one hand, recovering social contact (by vocalizing at high frequencies) and, on the other, avoiding a predatory danger (by remaining silent) (Bari, *et al.,* 2021 & Suarez, Gallup, 1983). Additionally, But going back to the familiar surroundings is different.

3.2. Human Approach Test

During the first 30, 60, 90, 120, 150 and 180 seconds observation, T1 has higher scores (4.25%, 6.00%, 4.75%, 9.00%, 6.25% & 11.25%), while T3 has lower scores (1.56 – 4.50%) respectively. From this finding, it shows that there is significant difference between T3 and T1 in terms of the durations used for observation. Higher scores obtained in T1 might be attributed to being enclosed/indoor. This shows that the birds are more familiar with the presence of the experimenter and the higher the time, the more adaptive and comfort with experimenter they become and vice-versa. Meaning, the birds are comfortable and had no fear with the human interactions. Despites the outdoor access by T3 and being exposed to many factors, it shows that T3 does not satisfy the Welfare Quality Poultry Protocol. With their lower scores, it shows that having access to free range was a preference over T1.

Table 6 Human Approach Test (HAT) assessment of Noiler chickens raised under different housing types.

Duration	**T1)**	**T2)**	**T3)**	**SEM**
30 seconds	4.25^{a}	3.00^{ab}	1.56^{b}	0.66
60 seconds	6.00^{a}	3.75^{ab}	2.19^{b}	0.71
90 seconds	4.75	4.38	3.93	0.80
120 seconds	9.00^{a}	5.63^{b}	3.19^{b}	0.85
150 seconds	6.25	5.50	4.06	0.78
180 seconds	11.25^{a}	5.50^{b}	4.50^{b}	1.34
first approach	0.00	0.00	0.00	0.00

$^{a-b}$ means within rows bearing different superscripts differs significantly at $p < 0.05$. SEM – Standard Error of Mean.

The present study is in consistence with Mona *et al.,* (2020), they reported that behaviour of the birds suggests less fear of humans (Welfare Quality®, 2009). It is improbable that a particular behavior during complex fear-related reactions is merely the result of a single emotion, namely fear (Forkman, 2007). Therefore, the birds' behaviors may have been influenced by additional elements as imprinting, exploration, coping mechanisms, habituation, and cognitive development (Mona *et al.,* 2020). This holds true for the non-forced HA test, wherein the birds' voluntary behavior toward a stationary human is observed, just like in the current investigation (Waiblinger *et al.,* 2006). The effect of treatment on the percentage of birds eating during general behavior observations suggests that T1 may have been more motivated to look for possible feed sources. As a result, T1 exhibited more exploratory behavior in the test conditions. We have not verified if it was as a result of not having access to free range.

3.3. Carcass Analysis

The mean yields of carcasse visceration, live weight, dress weight, back weight, breast weight, neck weight, thigh weight, wing weight, and leg weight of the Noiler chickens in the 2 raising systems (T1/T3) are shown in Table 7 below. The result obtained shows that there is no significant differences among all the treatments in terms of live, dress, back, breast, neck, thigh, wing, and leg.

Table 7 Carcass Analysis/g/kg of Noiler chickens raised under different housing types.

Parameters	T1)	T2)	T3)	SEM
Live Weight (kg)	1.90	1.83	1.74	0.14
Dress Weight (%)	59.89	68.85	65.88	2.83
Breast Weight (%)	16.51	18.20	17.18	2.04
Wing Weight (%)	9.22	9.84	8.92	1.32
Back Weight (%)	13.69	13.58	13.26	1.91
Neck Weight (%)	6.55	5.92	5.80	1.09
Thigh Weight (%)	18.93	20.61	19.77	2.60
Legs Weight (%)	3.04	4.27	3.96	0.51

[a-b] means within rows bearing different superscripts differs significantly at $p < 0.05$. SEM – Standard Error of Mean.

In other words, there is statistical equality among all the treatments. The current study's findings are consistent with those of Sogunle *et al.* (2012) in that while stocking density was lower in the free-range treatment, the production system had no effect on the yield of the eviscerated carcass, breast, thigh, or wings ($P > 0.05$). On the other hand, due to forced motor activity, Wang et al. (2009) and Castellini *et al.* (2002) discovered that when birds in an organic production system had outside access and a decreased stocking density, the percentages of meat on their breast and thighs increased.

3.4. Offal Analysis

According to Table 8 of the results, there are no notable variations between any of the treatments in terms of the weight and yield of the intestine, heart, liver, gizzard, or pro-ventriculus. Production did not, in essence, statistically alter giblet weight or yield.

Table 8 Giblet and Offal Analysis of Noiler chickens raised under different housing types.

Parameters	T1	T2	T3	SEM
Gizzard (%)	2.28	3.20	2.54	0.38
Heart (%)	0.41	0.50	0.50	0.07
Liver (%)	1.47	1.67	2.05	0.20
Pro-Ventriculus (%)	0.31	0.45	0.45	0.05
Intestines (%)	4.97	6.07	6.47	0.77

[a-b] means within rows bearing differentsuperscripts differs significantly at $p < 0.05$.
SEM – Standard Error of Mean.

In agreement to this work, Castellini *et al.* (2002), reported that 70.3% carcass yield in 56-day-old broilers reared under a free range system. It was however, the same with offal's yield, there is no significant difference between pro-ventriculus, liver, heart, gizzard and intestines. More so, Castellini *et al.* (2002) found that broilers raised in the PESH production module produced considerably more offal than broilers raised in the free range system. Suleiman (2023) indicated, in contrast to these findings, that controlling energy intake is advantageous for both its impacts on growth rate and the detrimental effects of excessive consumption on carcass quality, which may lead to the accumulation of extra fat. Lower dietary energy levels cause the carcass to accumulate less fat (Suleiman, 2023). The weights and yields of the carcasses and components were unaffected by the examined treatments. Conversely, though.

4. CONCLUSION AND APPLICATION

In summary, the data indicates that birds on T3 engaged in the highest level of comb pecking. But for birds on T1, toe injury and walking difficulties are most common. When a new object is placed in their pens, the birds react similarly, with the exception that in T1 housing, there were more birds gathered around the object at 180 seconds than in T2 or T3. A similar reaction was noted in the test with the unexpected surroundings. It is clear that the wellbeing of growing Noiler chickens was not adversely affected by outdoor living in the absence of pasture.

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