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## Effects of Pasture and Integration with Rabbits on Internal Organs and Organoleptic Properties of Broilers

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### Abstracts

The effects of pasture and broiler integration with rabbits on internal organs and organoleptic properties of broilers were assessed using 180 unsexed broiler chicks. After brooding, the birds were made into group of ten per replicate. Six replicates were randomly assigned to each of the three treatments using Completely Randomized Design (CRD). Birds on intensive ( $T_1$ ) which served as the control, were managed according to conventional deep litter system. Partial free range birds ( $T_2$ ) were free to roam outside during the day (8am to 6pm) but still had access to standard broiler feed and water ad libitum. Birds integrated with rabbits ( $T_3$ ) were allowed to range within the rabbitry under the hutches. The starter phase and finisher phase lasted for 14 days and 28 days respectively. After the trial, 6 birds (3 males and 3 females) were selected from each treatment for organoleptic and internal organs assessment. Data obtained were subjected to analysis of variance procedure of SPSS Statistical software. Organoleptic test produced no variation except for tenderness and colour. Birds on partial free range were the best for carcass colour pigmentation, however, birds on intensive and integration with rabbits were not significantly different ( $p > 0.05$ ) for colour pigmentation. Weight of internal organs indicated no significant different except for spleen and abdominal fat. The length of small intestine was significant ( $p < 0.05$ ). The small intestine of birds on partial free range was significantly longer than both birds on intensive and integration with rabbits. Large intestine and caecum were not significantly different across the treatments. It was concluded that, broiler on partial free range and integration with rabbit was feasible and could thus be used as alternative broiler production especially for the rural dwellers and poor farmers who could not afford the intensive system of production.

**Keywords:** brooding, internal organs, meat quality, organic broiler production, palatability, pasture.

### Introduction

In recent years, consumer interest in specialty poultry products derived from free-range or organic production systems has been steadily increasing in the United States and Europe (Fanatico *et al.*, 2006). Under free-range or organic systems, birds have access to an outside area promoting foraging, feed selection and thus theoretically improving the welfare of the birds. Although outdoor access is intrinsic to the free-range system, there are large variations concerning the amount and type of outdoor access provided in most of the free-range and organic systems that are presently in practice in Europe and the United States. Therefore, although outside access is associated with pasture and invertebrate consumption, the nutritional value derived from the intake of such products is unknown and will vary dramatically with the system in use (Walker and Gordon, 2003).

The competition between man and livestock for available grains and the health hazards associated with some medication has called for broiler integration with rabbits and organic pasture poultry raising (O. R. C., 2007). This present competition between man and poultry for feed ingredients is due to insufficient production of local feed items. The time is approaching when government could put a ban on the use of maize (corn), barley, wheat and soya bean among others for animal production, thus forcing the livestock industries to look for alternative feed ingredients (World Poultry, 1997).

Over the years, much attention has been given to oil seeds, cereals and tubers as sources of feed for poultry, with little attention given to organic poultry production and/or integration of poultry with rabbits.

The objective of this study is to determine the effects of pasture and broiler integration with rabbits on internal organs and organoleptic properties of broiler chicken. This has become imperative due to the limited amount of work that has been carried out with broiler production on pasture (O. R. C., 2007) and broiler integration with rabbits.

### **Materials and methods**

The experiment was carried out at the Livestock Teaching and Research Farm of the University of Agriculture Makurdi, Benue State, Nigeria. Benue State falls within the Southern Guinea Savannah zone of Nigeria. The state lies between latitude 7° and 9° North and Longitude 7° and 10° East. It has a climate typical of the tropical zone because of its location. It has a temperature ranging from 25°C in October to 36°C in March while monthly rainfall varies from 13.73 cm in some places to 14cm in others (Wikipedia, 2013).

### **Experimental birds and their management**

Anak broiler chicks (250) were brooded for 21 days. A total of 180 broiler chicks were selected at the end of brooding using average weight of the flock (0.4kg) to select birds for each replicates. The birds were made into group of ten per replicate and six replicates were assigned to each treatment using Completely Randomized Design (CRD). There were three treatments: intensive (T<sub>1</sub>), free range (T<sub>2</sub>) and integration with rabbits ((T<sub>3</sub>). The experiment lasted for 6 weeks, the first 2 weeks were starter phase while the last 4 weeks were finisher phase. The birds were all fed commercial feed. For the intensive, 60 broiler chicks were reared on deep litter using standard broiler feed and production practices. The birds for free range system were moved out around 8:00am and returned back to their pen by 6:00pm on daily basis with carrying creates. Their feeders and drinkers were placed in shaded area and fenced with chain link fencing materials. This was to protect them from direct sunlight and to prevent access to their feed by other animals. The fencing materials were raised about six inches above the ground to allow the birds freedom of movement in and out of the fenced area. Six different coloured ropes were used as leg bands to identify the birds belonging to the six replicates. The broilers integrated

with rabbits were leg banded with 6 different coloured ropes for the groups (replicates) identification. The birds were allowed to range within the rabbitery under the hutches. Feeds and water were provided within the rabbitery *ad lib*.

### Data collection

At the end of 6 weeks experiment (trial), 3 males and 3 females were selected per treatment and used for carcass and internal organs assessment. For the purpose of palatability test, 2 females' birds were selected from each treatment. The breast muscle from each bird were removed and sealed inside polythene bags and cooked in water for 30 minutes from boiling point. Twenty members of the university community were invited to serve as panel of judges. The meats were assessed by panel of judges for aroma, flavor, tenderness, juiciness and overall acceptability.

### Experimental Design and Data analysis

The design of the experiment was Completely Randomised Design (CRD). Data collected were subjected to analysis of variance using the procedure of SPSS Statistical software (2011).

### Results

From the result obtained (Table 1), it was evident that organoleptic properties such as aroma, flavor, juiciness and overall acceptability were not significantly different ( $p>0.05$ ) from one another. Other parameters such as tenderness and colour were significantly different. The weights of internal organs (Table 2) were significantly different for two parameters (spleen and abdominal fat). Parameters such as gizzard, liver, heart, lunges, pancreas, oesophagus, proventriculus, crop, small intestine, large intestine and caecum were not significantly different ( $p>0.05$ ). Also the lengths of internal organs (large intestine and caecum) were not significant. However, the length of small intestine were significantly different ( $p>0.05$ ) with the birds under free rang having the longer small intestine.

Table 1: The effects of partial free range (T2) and integration with rabbits (T3) on palatability of carcass of Broiler chicken

| Parameters            | T <sub>1</sub>    | T <sub>2</sub>    | T <sub>3</sub>     | SEM  |
|-----------------------|-------------------|-------------------|--------------------|------|
| Aroma                 | 74.6              | 4.89              | 4.78               | 0.80 |
| Flavour               | 6.22              | 5.56              | 5.22               | 0.62 |
| Tenderness            | 5.00 <sup>a</sup> | 6.76 <sup>b</sup> | 4.50 <sup>a</sup>  | 0.55 |
| Juiciness             | 5.00              | 5.57              | 4.71               | 0.61 |
| Colour                | 7.22 <sup>b</sup> | 5.67 <sup>a</sup> | 6.67 <sup>ab</sup> | 0.42 |
| Overall acceptability | 7.44              | 7.33              | 7.33               | 0.39 |

*Mean values within a row with similar or without superscripts are not significantly different ( $p>0.05$ ). SEM = Standard Error of the Mean.*

**Table 2:** The effects of partial free range (T2) and integration with rabbits (T3) on weight and length of internal Organs of Broilers.

| Parameters           | T <sub>1</sub>     | T <sub>2</sub>                 | T <sub>3</sub>    | SEM  |
|----------------------|--------------------|--------------------------------|-------------------|------|
| Gizzard (g)          | 2.15               | 2.26                           | 1.80              | 0.14 |
| Liver (g)            | 1.86               | 1.90                           | 1.97              | 0.07 |
| Heart (g)            | 0.45               | 0.45                           | 0.49              | 0.03 |
| Lungs (g)            | 0.57               | 0.59                           | 0.58              | 0.05 |
| Pancreas (g)         | 0.21               | 0.20                           | 0.23              | 0.02 |
| Proventriculus (g)   | 0.42               | 0.45                           | 0.45              | 0.03 |
| Oesophagus(g)        | 0.13               | 0.18                           | 0.14              | 0.01 |
| Crop (g)             | 0.54               | 0.59                           | 0.63              | 0.02 |
| Small intestine (g)  | 2.75               | 2.91                           | 2.65              | 0.16 |
| Large intestine (g)  | 0.18               | 0.28                           | 0.25              | 0.03 |
| Caecum (g)           | 0.38               | 0.39                           | 0.34              | 0.03 |
| Spleen (g)           | 0.11 <sup>b</sup>  | 0.14 <sup>a</sup> <sup>b</sup> | 0.18 <sup>a</sup> | 0.01 |
| Abdominal fat (g)    | 0.80 <sup>b</sup>  | 0.79 <sup>b</sup>              | 1.91 <sup>a</sup> | 0.26 |
| Small intestine (cm) | 9.97 <sup>ab</sup> | 10.45 <sup>a</sup>             | 7.97 <sup>b</sup> | 0.57 |
| Large intestine (cm) | 0.57               | 0.63                           | 0.49              | 0.05 |
| Caecum (cm)          | 1.04               | 1.11                           | 0.93              | 0.06 |

Mean values within a row with similar or without superscripts are not significantly different ( $p>0.05$ ). SEM = Standard Error of the Mean.

## Discussion

The contribution of foraging to the nutrition of free-range chicken and chicken integration with rabbits are largely unknown. To evaluate the importance of pasture intake and integration with rabbits on the internal organs and meat (carcass) attributes, 2 treatments (broiler partial free range and integration with rabbits) were conducted with intensive as the control.

Absolute values of organoleptic properties indicate no significant different except for tenderness and colour. This finding agrees with the findings of (Dransfield and Sosnicki, 1999) who reported no significant difference in organoleptic properties of broilers except for tenderness. They observed that differences in tenderness may be due to the fact that fast growth in birds leads to larger muscle fibers and differences in proteolytic potential. Similarly, Fanatico *et al.* (2005) found no differences in the organoleptic characteristics and carcass yield of indoor and outdoor birds. Carcass of birds on intensive system and integration with rabbits were softer than those on free range. This could be due to limited space for exercise compare to those on free range which had more space for movement. The carcasses of birds on partial free range were yellowish in colour than those of birds on intensive and integration with rabbits as similarly reported by Ponte *et al.* (2007). The non-significant different among internal organs except for spleen and abdominal fat as observed in this study fairly agree with the findings of Dransfield and Sosnicki (1999). Small intestine was significant ( $p<0.05$ ) with partial free range having the longest and integration with rabbits having the shortest. Caecum and large intestine were not significantly different among the treatments.

### Conclusion and recommendation

The experiment was designed to assess the effects of partial free range and integration of broiler with rabbits on internal organs and organoleptic properties of broiler chickens. This study has demonstrated the feasibility of broilers being raised on partial free range and integration with rabbit. These could be used as alternative means to intensive broiler production especially for rural poor who cannot afford the cost of intensive system. Also, partial free range could be used for organic broiler production which is the preference of some consumers. The results of this experiment suggest further investigation along the line using other poultry species.

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