

MANAGEMENT, BLOOD AND REPRODUCTIVE PARAMETERS OF RABBITS REARED IN IMO STATE

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ABSTRACT

The scarcity of rabbits for research studies instigated this study which lasted for 3 months; on the management, haematological, serum biochemical and reproductive parameters of rabbits reared in the 3 zones (Okigwe, Orlu and Owerri) of Imo State. Data for this study were collected through questionnaire, on-the-farm assessment and sample (blood and semen) collection from the rabbits. The hutch/cage type of housing is the most prevalent in Imo State, constituting 73.58 %. Most rabbit farmers in Imo State (45.28 %) combine concentrate and forage in rabbit feeding, while 47.17 % of the rabbit house/environment was fairly clean, 30.19 % were dirty and 22.64 % were clean. Rabbits reared in Imo State, with ages ranging from 5 – 8 months recorded average live weight of 1.91 kg, while annual average kindling and litter size of rabbit does reared in Imo State were 5.67 and 7.43, respectively; with average litter survival rate of 60.16 % between parturition and weaning. Haematological analysis of the adult rabbits reared in Imo State recorded 27.80 %, 9.56 g/dl and $3.40 \times 10^6/\text{ml}$ in packed cell volume, haemoglobin concentration and red blood cell count, respectively, which were lower than normal reference values (PCV = 30 – 50 %; Hb = 10 – 15 g/dl; RBC = $3.6 - 7.5 \times 10^6/\text{ml}$). Total serum protein, globulin and urea values were lower than normal reference values (TP = 5 – 7 g/dl; globulin = 2.5 – 4 g/dl; urea = 20 – 45 mg/dl), recording 4.44 g/dl, 1.57 g/dl and 16.56 mg/dl, respectively. Semen parameters obtained from adult rabbit bucks reared in Imo State were found to be inferior to semen parameters of adult rabbit bucks reared in similar geographical locations and environment, but under standard management practices. This study is therefore necessary for the assessment and development of improved rabbit production strategies in Imo State.

Keywords: Management, rabbits, blood parameters, reproductive parameters, Imo State.

INTRODUCTION

Sequel to the need to fill the animal protein need of developing countries, the rabbit (*Oryctolagus cuniculus*) which has been described as a micro livestock specie (Onifade *et al.*, 1999) is likely the cheapest and sustainable means of producing high quality animal protein for expanding population of developing countries like Nigeria; no thanks to less attention given to rabbit production in developing countries, unlike other livestock species like poultry, sheep, goat and cattle (Assan, 2014).

Rabbits have exceptional attributes which include affordable or low cost management requirements, short generational and gestation intervals, fecundity, rapid growth rate genetic diversity, ability to utilize forage and agricultural by-products and adaptation over a wide range of ecological environment (Arijenwa *et al.*, 2000).

These attributes of rabbits are the reasons why rabbit production can provide the impoverished urban population and the resource-poor rural dwellers the opportunity to earn additional income on a sustainable basis. Furthermore, increased rabbit production will increase the availability of research animals for researchers and students in higher institutions (Iwuji, 2016). However, the profitability of rabbit production as an enterprise depends on the number of rabbits kindled per doe per year and the survival of the kits (Lukefahr *et al.*, 1991).

Unfortunately, rabbit production is still at subsistent level or emergent in Nigeria (Onifade *et al.*, 1999). Traditionally, rabbits have not been included to the food of the community, however, some people keep rabbits for meat (as bush meat delicacy), as pet or for research purposes (khan *et al.*, 2014). Recently, especially in Imo State,

sourcing rabbits for research works has turned into a nightmare and are very costly when seen, most times the needed number or types may not be available. Therefore it becomes imperative to conduct this study on the assessment of rabbit production in Imo State, with emphasis on their management, blood and reproductive parameters, for the realization of possible solutions to rabbit scarcity.

MATERIALS AND METHODS

This study lasted for three months and covered the three zones (Okigwe, Orlu and Owerri) in Imo State (Figure 1). Imo state is situated in the southern rain forest vegetation belt of Nigeria. It lies within latitudes 4°45'N and 7°15'N, and longitude 6°50'E and 7°25'E (Wikipedia, 2016). The area is dominated by plains 200 m above sea level except for elevations associated with the Okigwe uplands. It has an annual rainfall of about 1700 to 2500 mm, which is concentrated almost entirely between March and October. Average relative humidity is about 80 % with up to 90 % occurring during the rainy season. The mean daily maximum air temperature ranges from 28 to 35 °C while the mean daily minimum ranges from 19 to 24 °C. (Okoli *et al.*, 2007). In this rainforest zone, smallholder livestock production predominate with over 80 % of rural families keeping West African Dwarf (WAD) ruminants and mixed breeds of local and exotic chicken, primarily as source of investment, manure and meat at home or during festivals. In most parts of the State, livestock are allowed to roam throughout the seasons with little supplementation from kitchen wastes. Prophylactic management of common infectious diseases is rarely practiced. (Okoli *et al.*, 2007). Data for the assessment of rabbits reared in Imo State were collected through a pre-designed questionnaire, on the farm assessment and laboratory analyses of blood and semen of the rabbits. A total of 53 rabbit farms were identified in Imo State (Okigwe zone = 13, Orlu zone = 16, Owerri zone = 24) and were assessed physically and through interviews which was based on the questions in the questionnaire. Only live weight of adult male and female rabbits (5 months and above) were measured using a digital scale. The number of kits the does kindle at the time of birth were recorded as the litter size. In each of

the three zones, blood and semen samples were collected from six farms that were evenly distributed, for hematological, serum biochemical and semen analyses. In each farm selected, blood samples were collected from two adult male and female rabbits each, while semen were collected from three adult male rabbits in each farm selected. Blood samples were collected through the ear of the rabbits using needle and syringe, after which blood samples for hematological analysis were discharged into Ethylene Diamine Tetra-acetic Acid (EDTA) bottles, while those for serum biochemical analysis were discharged into bottles without EDTA. Semen samples were collected with the help of a teaser doe, using artificial vagina (AV) as described by Herbert and Adejumo (1995). The blood and semen samples collected from the farms were analyzed at the Animal Science and Technology Laboratory, Federal University of Technology, Owerri.

Statistical analysis

The data base was prepared using Microsoft Excel and the mean values and percentage distribution of the various parameters computed.

RESULTS AND DISCUSSION

Management practices were evaluated based on housing, feeding and cleanliness of the rabbit house or environment. The rabbits in Imo State were mainly housed in hutches/cages, open room and burrows. It was observed that burrows were not intentionally provided by the farmers, but were dug by the rabbits kept on non-cemented floors or broken cemented floors, thereby exposing the earth. The hutch/cage type of housing was the most predominant in Imo State, recording a total of 73.58 % than the 20.75 and 5.66 % recorded for open room and burrow, respectively.

Greater percentage (45.28 %) of farmers in Imo State feed both concentrate and forage/household products to their rabbits, a slightly lesser percentage (43.40 %) feeds only forage/household products, while only a small proportion of the farmers (11.32 %) feed only concentrate to their rabbits; and are mainly those who cannot afford to go and look for forage or have difficulty in accessing them.

In terms of cleanliness of the rabbit houses (clean, fairly clean or dirty), 47.17 % were fairly

clean; 30.19 % were dirty, while 22.64 % were clean. It was observed that farmers who recorded clean rabbit environment were those who have knowledge (formal and informal) of rabbit production and they also keep some farm records.

Production performance evaluation of rabbits reared in Imo State recorded an average live weight of 1.91 kg for rabbits between the ages of 5 – 8 months, while annual kindling and litter size of the does recorded 5.67 and 7.43, respectively. Average survival rate of the litters (Parturition – weaning) was 60.16 %. Although these parameters are largely dependent on the type of management, like nutrition, time of weaning and fattening period (Onifade *et al.*, 1999), they are generally low, compared to the values obtainable in temperate countries and in enhanced/adequate management situations (Onifade *et al.*, 1999; Oseni, 2012).

In Imo State, rabbits are raised for the purposes of meat production, source of revenue, research and as pet animals. Farmers in Imo State who rear rabbits for the purpose of revenue generation comprise 56.60 %, while farmers who rear rabbits for meat production, pet animal and research comprise 18.87, 15.09 and 9.43 %, respectively. It was observed that the purpose of the rabbit farming affected some of the management practices carried out by the farmer. For instance, those who were rearing for research purpose were keeping some farm records. Although during sourcing of rabbits for research, the student or researcher may buy from those whose purpose of rearing rabbits are not for research which may lead to non availability of the history or records of the rabbits bought.

The constraints to rabbit production in Imo State include fund, space, predators/theft and diseases. According to the farmers, 54.72 % of the constraints are fund-based, while space, predators/theft and diseases contribute 26.42, 7.55 and 7.55 %, respectively. It is quite surprising that greater percentage of the farmers complained of funds, when rabbit production venture has been adjudged to favour poverty reduction programmes on account of their low investment and early benefits, subsistence on renewable resources for feeding, housing and general management (Onifade *et al.*, 1999; Oseni, 2012).

Haematological analysis of adult rabbits reared in Imo State recorded average value of 27.80 % in packed cell volume (PCV), 9.56 g/dl in haemoglobin (Hb) concentration, 3.40×10^6 /ml in red blood cell count (RBC) and 11.67×10^3 /ml in white blood cell count (WBC). The white blood cell differentials recorded 44.94, 49.77, 1.67, 2.33 and 1.00 % for lymphocytes, heterophils, monocytes and basophils, respectively. The PCV, Hb and RBC of the rabbits were quite lower than the reference values for adult rabbits (Mitruka and Rawnsley, 1977; Merck, 1998) and could be attributed to poor nutrition of the rabbits, while the elevated WBC count and percent heterophils above the normal reference values may be due to morbidity resulting from poor management of the rabbits.

Serum biochemical analysis of rabbits reared in Imo State recorded average total protein (TP), albumin and globulin of 4.44, 2.87 and 1.57 g/dl, respectively. Total protein and globulin values of the rabbits were below the recorded reference values (Mitruka and Rawnsley, 1977; Merck, 1998) which could be due to low amino acid profile of the feeds fed the rabbits. The low TP probably affected only the globulin values, since the albumin values were within the normal values. This may result in low production of immunoglobulin which helps in the immune system of the rabbits (Frandsen *et al.*, 2009). The rabbits recorded average urea, creatinine, glucose and cholesterol values of 16.56, 2.33, 110.6 and 47.38 mg/dl, respectively; while the average values of alkaline phosphatase (ALP), alanine transaminase (ALT) and aspartate transaminase (AST) were 85.31, 53.26 and 83.88 IU/L, respectively. Urea is a product of protein metabolism (Frandsen *et al.*, 2009), therefore, it could be that the recorded average urea value of rabbits reared in Imo State, which is below the reference normal values, may be as a result of the low TP of the rabbits.

The semen volume, sperm concentration, total sperm, progressive sperm motility and live sperm proportion of the rabbits reared in Imo State recorded average values of 0.59 ml, 166.20×10^6 /ml, 98.30×10^6 , 58.54 % and 77.38 %, respectively. Comparing the semen parameters recorded in this survey with semen parameters recorded in some empirical studies carried out in similar geographical locations and environment

with Imo State, but under standard management practices (Yousef *et al.*, 2003; Ahmed *et al.*, 2008; Iwuji and Herbert, 2012; Ogbuwu *et al.*, 2012), it was observed that the semen parameters of the rabbits reared in Imo State were inferior. Inferior semen parameters in adult rabbit bucks and some other animal models have been recorded with feeding of forage or administration of plant extracts without appropriate concentrate supplementation (Herbert *et al.*, 2005; Eze, 2012). The inferior semen parameters of rabbits reared in Imo State may be due to the high forage feeding of the rabbits (Table 1) without adequate concentrate supplementation.

CONCLUSION

This study has revealed that rabbit farmers are very few in Imo state and the rabbit farms are being poorly managed, resulting in low production and performance which were probably caused by poor nutrition, low survivability of the litters, low live weight, morbidity and poor reproductive characteristics. The purposes of the majority (56.6 %) of the rabbit farmers are to generate revenue, but unfortunately, they lack the adequate knowledge of rabbit production as evident in the performance of their farms and from the interactions with them.

RECOMMENDATIONS

Based on the findings of this study, we recommend the following;
That relevant agencies and institutions should embark on enlightenment campaign on the need and benefits of rearing rabbits.
Provision of incentives and adequate knowledge of rabbit production to intending rabbit farmers.
Increased research in rabbits so as to develop modern production techniques that will help increase rabbit performance and production.

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Table 1: Distribution (%) of management parameters of rabbits reared in Imo State.

Parameters	OKZ	OLZ	OWZ	Total
<i>Housing:</i>				
Hutch/Cage	61.54	75.00	79.17	73.58
Open room	30.80	18.75	16.67	20.75
Burrow	7.69	6.25	4.17	5.66
<i>Feeding:</i>				
Concentrate	15.38	6.25	12.50	11.32
Forage/Household products	46.15	81.25	16.67	43.40
Both	38.46	12.50	70.83	45.28
<i>Cleanliness of rabbit house:</i>				
Clean	30.77	25.00	16.67	22.64
Fairly clean	30.77	37.50	62.50	47.17
Dirty	38.46	37.50	20.83	30.19

OKZ = Okigwe zone; OLZ = Orlu zone; OWZ = Owerri zone.

Table 2: Performance and production parameters of rabbits reared in Imo State.

Parameters	OKZ	OLZ	OWZ	Total
Live weight (kg)	1.94	1.76	2.04	1.91
Annual kindling	5.8	5.00	6.2	5.67
Litter size	7.20	7.00	8.10	7.43
Litter survival rate (%)	58.33 (4.2)	68.57 (4.8)	54.32 (4.4)	60.16 (4.5)

OKZ = Okigwe zone; OLZ = Orlu zone; OWZ = Owerri zone

Table 3: Distribution (%) of the purposes of rabbit farming in Imo State.

Parameters	OKZ	OLZ	OWZ	Total
Meat production	15.38	37.50	8.33	18.87
Source of revenue	61.54	43.75	62.50	56.60
Research	7.69	6.25	12.50	9.43
Pet/Entertainment	15.38	12.50	16.67	15.09

OKZ = Okigwe zone; OLZ = Orlu zone; OWZ = Owerri zone

Table 4: Distribution (%) of the constraints to rabbit production in Imo State

Parameters	OKZ	OLZ	OWZ	Total
Fund	46.15	56.25	58.33	54.72
Space	23.08	25.00	29.17	26.42
Predators/Theft	7.69	12.50	4.17	7.55
Diseases	7.69	6.25	8.33	7.55

OKZ = Okigwe zone; OLZ = Orlu zone; OWZ = Owerri zone

Table 5: Haematological parameters of rabbits reared in Imo State

Parameters	OKZ	OLZ	OWZ	Total	Ref. values*
Packed cell volume (PCV) (%)	27.31	28.00	28.10	27.80	30 – 50
Haemoglobin (Hb) conc. (g/dl)	9.40	9.82	9.46	9.56	10 – 15
Red blood cells ($\times 10^6/\text{ml}$)	3.28	3.81	3.10	3.40	3.6 – 7.5
White blood cells ($\times 10^3/\text{ml}$)	12.31	12.28	10.41	11.67	4.5 – 11
Lymphocytes (%)	41.00	42.42	51.40	44.94	40 – 80
Heterophils (%)	53.30	51.80	44.21	49.77	35 – 43.2
Monocytes (%)	2.00	2.00	1.00	1.67	1 – 4
Basophils (%)	3.00	2.00	2.00	2.33	1 – 7
Eosinophils (%)	1.00	1.00	1.00	1.00	- 4

*(Mitruka and Rawnsley, 1977; Merck, 1998). OKZ = Okigwe zone; OLZ = Orlu zone; OWZ = Owerri zone

Table 6: Serum biochemical parameters of rabbits reared in Imo State

Parameters	OKZ	OLZ	OWZ	Total	Ref. values*
Total Protein (g/dl)	4.42	4.81	4.10	4.44	5 – 7
Albumin (g/dl)	2.94	3.42	2.26	2.87	2.5 – 4
Globulin (g/dl)	1.48	1.39	1.84	1.57	2.5 – 4
Urea (mg/dl)	16.24	17.01	16.44	16.56	20 – 45
Creatinine (mg/dl)	2.41	2.32	2.26	2.33	0.5 – 2.6
Glucose (mg/dl)	101.2	110.4	120.2	110.6	75 – 155
Cholesterol (mg/dl)	43.45	51.44	47.24	47.38	10 – 80
Alkaline phosphatase (IU/L)	84.60	86.11	85.23	85.31	10 – 96
Alanine transaminase (IU/L)	53.21	54.14	52.44	53.26	55 – 260
Aspartate transaminase (IU/L)	81.43	84.12	86.08	83.88	10 – 98

*(Mitruka and Rawnsley, 1977; Merck, 1998). OKZ = Okigwe zone; OLZ = Orlu zone; OWZ = Owerri zone

