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Temperature: As an Essential Factor in Designing Poultry Housing in Nigeria

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Abstract: *The effect of temperature as an environmental factor to note in poultry housing construction is manifested in both the extreme conditions. The thermo-neutral zone of the Adult fowl within which its performance is not adversely affected by temperature range of 12.8-26.0°C. When temperature fall below or above this range, uneconomical production consequences result in all categories of birds (Chicks, growers, layers and breeders). However, high temperature effects can be alleviated by a number of measures, some of which related to the treatment given to birds, while others are concerned with the modification of the construction of the poultry house.*

Keywords: *Temperature,Poultry, Layers, Growers*

INTRODUCTION

Animals like human beings are directly affected by weather elements. Extremely low or high temperatures interfere with the physiological functions of animals. The productive capacities of animals also tend to decrease under high temperature conditions (Critchfield, 1971).

It is widely known that animals in a hot climate are influenced directly by heat radiation and possibly humidity (Webster and Wilson, 1966).

The environment to which the fowl is exposed, is determined by the system of management which includes the design of housing used for the birds. Two important components of environmental condition influence construction of poultry housing i.e temperature and humidity. An interaction of these two often results in thermal stress.

Nigeria is fortunate to be in a geographical region in which good poultry housing can be constructed at minimum cost. A good poultry house is the one that can provide the following necessities: protection from pests, sunlight and rain, provide adequate ventilation, minimize ammonia build-up, and reduce humidity.

A design that best satisfies these in tropical region like Nigeria is “Opened – sided house”. Temperature conditions do not vary to extremes in Nigeria, unlike some countries an extremely low or high temperature prevails. In general, environmental temperatures are not homogenous in the country at any particular time, it varies from place to place

and season to season. The variation are according to 3 – geographical zones in the country: a dry desert zone prevalent in the north, a middle – belt savanna region and a rainforest region of the southern Nigeria.

TEMPERATURE CONDITION

In the north, mean temperatures are usually between the ranges of 24 – 26°C during the months of December and January while the months of June – November have mean temperature ranges between 26 – 30°C, average mean temperature from February – May are above 33°C. It is only in the northern part of the country that very high temperature prevails. In the savanna and southern regions, the hottest months of February – May have a minimum temperatures of 23 - 28°C, the other remaining months have ideal temperatures for poultry farming.

Consequently, commercial poultry production in Nigeria is dominant in these two regions. Though, there are some environmentally controlled poultry house in the country, an open house poultry design is the commonest and the most popular choice.

EFFECT OF TEMPERATURE AND HUMDITY ON POULTRY

The avian specie are homiothermic and hence less affected by environmental variation of temperatures than the poikilotherms. Homiothermy in the laying birds is controlled by a centre located in the hypothalamus and it embraces thermogenesis and thermolysis. Thermogenesis is the derivation of heat from energy metabolism and from the environment. While thermolysis is the loss of heat to the surrounding through sensible heat, which heats the surroundings (radiation, conduction and convection) and insensible heat (evaporation).

Increase in environmental temperature leads to increased dependence on insensible heat loss for maintaining body temperature. An environmental temperature of 26.6°C causes a rise of 0.1-0.4°C in body temperature above the normal, the rise of temperature of the blood flowing to the brain initiates painting. This causes a dramatic rise from 5-30g of water loss per hour through evaporation.

High temperature lead to reduction level of performance feather coverage is also poorly developed and this leads to pecking in adult birds, egg size, specific gravity and shell thickness are reduced at temperatures above 22°C. In fact, production is depressed at temperatures constantly above 29°C while mortality is increased at 35°C. In breeders, fertility and hatchability are decreased and so are the frequency of mating under high temperatures. Feed intake in layers is reduced by 1.7% per 1°C rise on the average. Mortality rate may be decreased in chicks through huddling or suffocation. Low temperature also reduces feed efficiency in chicks. In adult birds, feed efficiency is decreased as more feed is utilized for body maintenance thus reducing egg production and quality.

REDUCING THERMAL STRESS IN POULTRY HOUSE

Thermal stress in poultry can be reduced by measures which involve treatment of the birds or by manipulating the construction of the poultry housing. Example of construction manipulating are among others, straight-through-ventilation, high roof and suitable roofing materials.

Other house construction measures are: insulation of the roof, air misters, installing evaporative coolers and foggers.

CONSTRUCTION

The major features of this type of house are:

A. A concrete foundation of 0.45m deep with 1m high dwarf side walls made from bricks or cement blocks.
B. Internal features are kept at a minimum to permit maximum ventilation in the house.
C. Open side walls above the 1m high dwarf wall protected by wire netting and curtains and supported with a frame work of timber.
D. The widths of the house are kept at 7.2-10m with the building sited on an east west orientation to take advantage of di-urnal wind movement and also to limit solar heat load.
E. Houses for cage units may reach 12m high in width permitting four rows of cage.
F. A corrugated iron sheet roofing with asbestos board insulation beneath. This is important in conserving heat during the cold harmattan period. It also prevents radiant heat common in the hot periods of February – May.
G. A roof overhang of 1 – 2m is provided this limit direct solar gain and also helps to check rain drift.
H. The difference between the ridge and eave heights is kept to about one quarter of the width of the house for the houses of 7.2m or less in width, but wider houses have a lower ratio of ridge height to width, so that the house will not be too high.
I. A gable roofing with ridges as a means of enhancing adequate ventilation is also a prominent feature of the house.
J. Provision of air inlets near the foot of the building, a little above the foundation measuring 45cm x 30cm and properly screened with wire netting to prevent entry of wild birds, insects and vermin. The air inlet allows the maximum flow of fresh air at litter level.
K. Litter materials used are wood shavings, crushed cobs of maize, crushed dry kenaf stems and peanut shells.

VENTILATION

However, devices such as fans and water spray gadgets are installed in some hot areas of the northern Nigeria to reduce stress. When power is available with stand by generating set, fans are placed on the wind-ward side of the house to increase the air speed as it blows the air length wise of the building.

In the extreme desert north of Sokoto and Maiduguri, where temperatures could reach 37^{o}C, micro jet sprinklers are installed on the roof or on the ground to aid in cooling the house and its surroundings.

Layers in erected poultry house with corrugated metal sheets for the walls and the roof without insulation have been observed to suffer loss in egg production during hot periods. Temperature ranges in such houses are between 30-40^{o}C whereas comfort zone for layer birds lies between 13-21^{o}C. To corroborate with the above statement, Oluyemi and Robert (1979) reported that under controlled conditions, eggs per 1,000 hens per day at 12.8^{o}C to 550 eggs per 1,000 hens per day at 29.4^{o}C, amounting to loss of 230 eggs per 1,000 hens per day.

AFFORDABILITY

The low cost of building of the house coupled with low cost of electrical and mechanical installations with its attendant low maintenance cost, has endeared this system to many poultry farmers who otherwise could not afford the expensive equipment needed for the controlled house, its maintenance and the attendant high cost of power

consumption, its demand proved a set-back to poultry production in the country due to irregular supply of power.

EXPECTED EGG PRODUCTION

At a suitable temperature condition provided by the proposed house of between 12-13^{o}C, about 700-800 eggs are to be realized per 1,000 hens per day.

CONCLUSION

Poor poultry production is most common in Nigeria with an all-in-all corrugated sheet metal house which exposes the birds to high temperatures. A modern approach in the construction of an open house can greatly improve the standard and number of poultry in the country. This modern approach should imbibe a combination of techniques for better result. Roof painting, roof sprinklers and internal misterms may work satisfactory in a condition where relative humidity is low.

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