

Role of Light in Poultry

Smriti Sharma¹, Priyanka², Gitesh Saini³ and Ravinder⁴

¹ Department of Animal Genetics and Breeding, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar-125004, Haryana, India

² Department of Public Health and Epidemiology, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar-125004, Haryana, India

³ Department of Veterinary Gynaecology and Obstetrics, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar-125004, Haryana, India

⁴ Department of Animal Nutrition, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar-125004, Haryana, India

ARTICLE ID: 42

Introduction

Poultry is a quickest and easiest source of animal protein at minimal cost and in shortest possible time for human consumption. The main objectives of poultry farming earlier were to improve body weight and feed efficiency. Lighting is an essential for development and functioning of reproductive system and growth. Cold Cathode and Fluorescent bulbs are mostly used as light and it is affected by variables like lamp type, reflectance of the floor, walls, ceiling and height intensity of affect. Lighting patterns for broilers are aimed for stimulating and controlling feed intake. Light as an environmental factor consists of three different aspects like intensity, duration, and wavelength. Darkness is an important to growth and health of broilers as light.

Importance of Light

Light is required for vision, rhythm city and hormonal stimulation to control growth, maturation and reproduction. Most birds are tetra chromatic having four types of cone cells which results in better colour vision. Importance of sight to poultry birds is clear from the fact that combined weight of both their eyes is same as their brain. Their visual ability is far superior to human as their colour vision extends to the UV region and can view up to 330°. The pattern of changing day length experienced by birds influences them in two ways:

- Increasing natural day length, as occurs in spring, accelerates sexual maturity of growing pullets and stimulates egg production during the laying period.
- Decreasing day length, as occurs in autumn, retards sexual maturity of growing pullets and restrains egg production.

Impact of Light in Poultry Industry

Light programs such as continuous, intermittent, restricted, combination of intermittent and restricted and increasing photoperiods is of common practice in poultry industry. Photoperiod affects productivity, health issues, immunity and sexual maturity in birds. Photoperiods govern the feeding behaviour where birds eat majority of food during daytime. Photoperiod regulates melatonin secretion from pineal gland which affects thermoregulation, reproduction and behaviour of birds

Circadian rhythm

Ovulation depends on an endogenous mechanism that is closely related to external factors. The synchronization of these factors is called circadian rhythm or biorhythm. Layers use circadian rhythms to perceive the duration of the day and they are most sensitive to light between 11 and 15 hours after the light is turned on. During this photosensitive phase, a neural-hormonal mechanism controls the reproductive functions.

Importance of Light for Layers

- The aim of any lighting program for layers is to supplement the varying natural daylight so that an even pattern of total light is received throughout the year. Lighting programs used in layer production are classified according to photoperiod into hemeral and ahemeral. Hemeral lighting programs consist of 24-h periods divided in light phases (photoperiod or photophase) and dark phases (scotoperiod or scotophase). Hemeral programs are used in open-sided houses, which take advantage of natural light. Hemeral programs are classified as continuous or intermittent. In continuous programs, artificial lighting complements natural lighting to establish a long and continuous photoperiod, while intermittent programs alternate light (photophases) with dark periods (scotophases).
- Ahemeral lighting programs are used to improve eggshell quality and egg size, without affecting egg production. They are applied in environmentally-controlled facilities mainly in Europe and in the United States. Ahemeral programs apply photophases and scotophases that are shorter or longer, but not equal to 24h, and may be continuous or intermittent.
- Egg production is reduced if light intensity is insufficient. Therefore, a luxmeter should be used to precisely determine light intensity in layer houses. The minimum



light intensity required for maximum egg production is 5.38 lux in dark houses for layers. In open-sided houses, 10 lux are needed at cage or bird's head height. This recommendation is accepted by the Illuminating Engineering Society of North America (IESNA, 2001), which performed a study that determined that a daily period of 14 hours of light for optimal egg production and that more than 17 hours of light negatively affect egg production. Because the visual system of chickens responds to light radiation within the visible spectrum range of 664-740 nm, the lamps used in layer houses should emit light within this range.

Importance of Light for Broilers

- Lighting patterns for broilers are aimed mainly at stimulating and controlling feed intake. Two programs are commonly used: a) Continuous lighting except for 1 hour of darkness) Intermittent lighting of 2 hours on, 2 hours off.
- Broiler behaviour is strongly affected by light intensity. Generally, brighter light will foster increased activity, while lower intensities are effective in controlling aggressive acts that can lead to cannibalism. Producers regularly use modern electronic systems to increase light intensity for short periods during grow-out to increase exercise and thereby reduce skeletal and metabolic disorders.

Light Duration:

Lighting duration, i.e., photoperiod, is the second major aspect of light that will alter broiler performance. Lighting duration is largely dependent upon the age of chickens involved and type of housing in use. However, results to date suggest an absolute minimum uninterrupted dark period of 4 hours should be given, but the requirements for sleep may be higher at certain points of the growing period.

Photoperiod

Longer photoperiod is reported to improve yield and FCR but affect the eye, increases leg problems, body asymmetry, stress and health issues of birds. Similarly, shorter photoperiod reduces feed intake, growth and breast meat yield. Further, the changing light dark cycles not only reduces fear in broilers but it was also found to improve growth and health of the birds as compared to continuous or near continuous (23L: 1D) light schedule. Long period of darkness is not beneficial as feed intake gets considerably reduced resulting in fasting, hunger, frustration, nutritional stress and eye abnormality in broilers.

Light schedule 16L:8D was found beneficial as it reduces physiological stress, leg problems, chronic fear and positive welfare including improved immunity, increased sleep and leg health in birds. Intermittent lighting has gained considerable importance during last few years. It not only saves electricity and reduces cost of production but also significantly improves growth and feed efficiency in birds. Green, blue and UV light favours hatching, skeletal development, post hatch growth effects and fertility in poultry birds. Layers incubated at dark showed difference in pecking behaviour during the rearing period. Fluorescent light has positive effect on vision and physical activity of birds.

Colour of Light:

Colour is the third major aspect of light. It is dictated by wavelength and it exerts variable effects on poultry performance. Blue light has a calming effect on birds, while red will enhance feather pecking and cannibalism. Blue-green light stimulates growth in chickens, while orange-red stimulates reproduction. During the early period, short wavelengths appear to stimulate growth. However, when the bird approaches the time of sexual maturity long wavelengths (orange red) increase growth and are effective in stimulating sexual hormonal pathways.

Light intensity

Light intensity (measured in lux or foot candle) has its importance in poultry farming. Higher light intensities in near continuous light period have negative effects on health, increases eye problem increase mortality and induces aggressive pecking behaviour in birds. It was found that higher light intensities increase physical activity and reduces leg abnormality. Low light intensity increases feed conversion and promotes higher body mass in birds. Low intensity light also increases eye problems and compromises welfare among birds.

Conclusion

Light management is an important component of poultry production. Wavelength and intensity are important in behavioural modifications while exposure of poultry to darkness is essential to bird health. Restricted lighting programs enhance poultry production through improvements in BW, FCR, immune status, and better health as a result. To assess this meaningfully, it is important to understand how birds perceive their environment and to quantify aspects of the physical light environment, especially luminance and photo period effects, on the functional development of the eye and vision. It can be concluded that light



plays an important role in poultry industry, as optimum lighting condition not only increases production efficiency but also take care the welfare issues of the poultry birds. In addition, electric consumption is also higher in the continuous lighting regiment. Thus, intermittent lighting schedule seems to be more suitable because it not only saves electric consumption, but also results in similar weight gain as compared to continuous lighting.

