Paper PO01-2012

Use of SAS® to determine broiler chick feed color preference in correlation with performance under different housing light colors.

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ABSTRACT

Rapid changes in lighting types designed to reduce energy usage have increased the options avaliable for animal producers. Recent research indicates a positive correlation in broiler growth and welfare regarding light preference. Consequently, results of recent findings have led to the investigation of feed and light color on overall performance and welfare. Specifically, fifty newly hatched Cobb 500 broiler chicks were housed in pens illuminated with red, blue, green, yellow, or a control white light. Under each light, broilers were offered red, blue, green, yellow, and a control brown colored feed. Feed was colored using commercial food coloring. Chick color preference was recorded after at least two attempts to obtain feed crumbs; an undecided was recorded for chicks that took longer than 5 minutes to try feed. SAS® 9.0 MEANS procedure was used to analyze data; then, FRECENCY and LOGISTIC procedures in combination with the goodness test determined overall color preference for feed and housing combinations. Overall, research showed a significant difference in light and color preference between chicks. Housed under blue light, chicks displayed a significant preference for red feed. However, under red house lighting, chicks showed a preference for the control brown feed. Ultimately, statistical analysis showed that chicks do display a color preference for both housing and feed.

INTRODUCTION

Animal welfare has and will continue to be a concern for both consumers and animal producers. Consumers' demand for animals to live a pain-free happy life before slaughter has shifted how the production industry raises poultry. It is not uncommon for consumers to associate good healthy food with high animal welfare standards. All over the world countries are enforcing and implementing new laws and regulations to ensure animal welfare is at its highest. The goal of producers is to house animals in the most natural setting possible.

For years, the effects of lighting on poultry performance have been heavily researched. Amount of light, color, placement, intensity, and wavelength play a role in bird growth and production. Typically, broiler chickens are raised under blue or green incandescent bulbs. The green and blue color has been shown to reduce stress in the birds and aid increased growth performance. It has been determined that broilers raised under blue or green lighting tend to exhibit higher growth when compared to birds housed under red or white lighting (Coa et. al. 2008).

Little research has been done exploring bird light color preference. One study indicated, however not looking at light color but rather pen floor colors and patterns concluded that birds have preferences for red over grey and complex patterns (Berryman et al. 1971). Preference was determined by placing a rectangular box with different colors on either end. When the bird moved closer to one end over the other it was considered a preference selection by the animal. Ensuring birds get adequate feed during their first few days of life is critical for bird performance. By housing animals under colors they prefer and offering feed that is colored to suit the preference of the bird there is potential to increase interest in consuming feed. In 2007 Heshmatollah was investigating bird behavior under different light intensities, although not focusing on preference, it was noted that birds do have preference for green light when compared to red, orange and yellow lights. It was also concluded that birds had a preference for orange-dyed feed when fed under low light levels and green-dyed feed under high light levels, thus indicating housing birds under colors they prefer has the potential to increase interest in feed.

The industry is currently using blue and green colored lights for broiler chick production facilities. Optically, feed dyed red under white lights is perceived differently when compared to green or blue lights. This study investigated broiler preference for feed color under different housing light colors.

MATERIALS AND METHODS

Experiments were conducted at the Thomas B. Avery Poultry research unit at Kansas State University. Proper animal care and use protocols were followed. Fifty, day-old Cobb 500 male broiler chicks were placed in five pens (ten birds per pen). Each pen was equipped with a different color Phillips 100 W Colortone Outdoor Floodlight bulb; blue, yellow, green, red, and white (control). All lights were set at the same intensity. To prevent light color interference from neighboring pens, black slatted plastic was installed between each pen. Each pen was approximately 1.52 m by, 3.66 m in dimensions. Each pen was also offered four different colors of feed: red, blue, green, yellow, plus a control light brown. The feed was colored during mixing by the addition of standard food color until the desire shade was achieved. Each feed was placed in small black trays directly under the light in the pen.

To determine preference, feed was placed in a circle and two birds were placed inside the circle and allowed to choose what color feed they preferred (Figure 1). Color choice was recorded on an individual bird basis the moment that the bird attempted to obtain the feed. When placed in the feeding circle, chicks were positioned facing different directions each time, lowering the risk of directional influence. Occasionally, birds were tested a second time during the same run to insure individual decisions were made and not influenced by the partnering bird. An undecided mark was recorded if after 5 minutes the chick did not show a preference. Four replications were recorded making 200 total runs. At three weeks of age the weight of each bird was recorded.

Figure 1. Feed color preference

DATA PREPERATION

Data sets were in need of preparation before analyzed in SAS® 9.0. Bird number, housing light color, and feed preference over the four-week testing period was recorded. The following data source code was used.

Source code:

```
data one;
    input Bird LColor $ R G B Y C U;
    nreps=4;
if LColor='R' then LColor='1R';
if LColor='G' then LColor='2G';
if LColor='B' then LColor='3B';
if LColor='Y' then LColor='4Y';
if LColor='W' then LColor='9W';
cards;

data two; set one;
    Fcolor='1R'; count=R; output;
    Fcolor='2G'; count=G; output;
    Fcolor='3B'; count=B; output;
    Fcolor='4Y'; count=Y; output;
    Fcolor='5C'; count=C; output;
    Fcolor='6U'; count=U; output;
    Drop R–U;
```

THE FREQUENCY PROCEDURE

The FREQUENCY procedure as been used by SAS® users for years and is a very well known analytical procedure. The PROC FREQ procedure was used here to compare the frequency of feed color choice to the 0.05 level of significance under each light color.

```
proc freq data=two;
    weight count;
    tables Lcolor*Fcolor/chisq expected cellchi2;
```

THE LOGISTIC PROCEDURE

Once frequencies were obtained the LOGISITC procedure was used to compare each light color and feed color combination to the undecided reference category. Logit= $\log(\pi_{ij}/\pi_{i6})$

```
proc logistic data=two;
    class Lcolor /param=glm;
freq count;
model FColor=LColor/link=glogit NOINT;
*lsmeans LColor/diff ilink;
*contrasts to do pairwise comparisons on LColor;
contrast 'LColor: 1R vs 2G' LColor 1  -1  0  0  0;
contrast 'LColor: 1R vs 3B' LColor 1  0  -1  0  0;
contrast 'LColor: 1R vs 4Y' LColor 1  0  0  -1  0;
contrast 'LColor: 1R vs 9W' LColor 1  0  0   0  -1;
contrast 'LColor: 2G vs 3B' LColor 0  1  -1  0  0;
contrast 'LColor: 2G vs 4Y' LColor 0  1  0  -1  0;
contrast 'LColor: 2G vs 9W' LColor 0  1  0  0  -1;
contrast 'LColor: 3B vs 4Y' LColor 0  0  1  -1  0;
contrast 'LColor: 3B vs 9W' LColor 0  0  1  0  -1;
```

CONCLUSION

From the data collected during the trial and the use of SAS® 9.0 analytical software it was found that there was significant difference for red feed preference when housed under blue lights ($P<0.05$). However, under red house lighting chicks displayed a preference for the control light brown feed. A trend was noted that under green lighting birds did not prefer the blue colored feed. In some situations it was observed that the housing light color could cancel out the effects of the feed color. For instance, under blue or yellow lighting red feed no longer appears red. When comparing light color to light color it was determined that green light differed from blue light ($P<0.05$). A difference was also seen when green light was compared to yellow light. There were more chicks choosing green feed and few undecided under yellow light ($P<0.05$).

Results of this study indicate that producers currently using blue lights in poultry houses should consider dying their fee red to increase the chicks interest in eating, especially in the first few days of life. Basic SAS® procedures made evaluation of this complex data set easier to analyze.

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