

STUDY THE EFFECT OF STRAIN MEASURES OF POST-RESUSCITATE AGING AND AGE AT SLAUGHTER ON BROILER MEAT QULITY

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ABSTRACT

The purpose of this study was to investigate the relationships between broiler strain, slaughter age, and post-chill (PC) aging duration in terms of measurable meat quality parameters. Two hundred fifty Hubbard on one day old chicks classic and two hundred fifty Lohman were bread in a commercial setting. Each strain had half of its broiler chicks slain at 32 days of age and the other half at 42 days of age. A total of 168 bodies (84 Hubbard and 84 Lohman) were selected at random on each day of processing, with each strain being divided into 28 groups and aged for 0, 4, and 24 hours. Each strain had a comparable average weekly body weight. Hubbard strain animals demonstrated greater feed conversion ratios during weeks two and three of life ($P \geq 0.05$). A bird's age had a significant effect ($p \geq 0.05$) on initial pH of the carcass, with birds that were 32 days old having lower pH values (41 days old). Carcass temperature of Lohman's was higher than Hubbard's at 0h, 2h, and 4h post-PC ($p \geq 0.001$). Breast temperature was lower in younger birds throughout all PC assessment intervals ($p \geq 0.001$). Stress, age, and aging time had no effect on thaw loss, cook loss, and water holding capacity. Meat of Lohman strain was softer ($P \geq 0.05$) than meat of Hubbard strain, and as broiler age and aging time rose, softness also improved. The Hubbard strain produced meat was lighter in color and less red than that of Lohman strain, which came from birds of that darker. It was determined that the breast meat quality features were most affected by strain, slaughter age and PC aging period and that softer fillet could be achieved by maturing for 4 hours before to deboning.

Keywords: slaughter age, breed, months of aging, and taste in broiler breast fillets

المهداوي

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دراسة تأثيرات السلالة، مقاييس تدرج اللحم حسب العمر والعمر عند الذبح على جودة لحوم فروج اللحم

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المستخلص

ان هدف هذه الدراسة هو معرفة العلاقة بين سلالة دجاج التسمين وعمر الذبح، وتأثيرها على الطراوة مع تقدم العمر ما بعد التبريد (PC) من حيث معايير قياس جودة اللحوم. تمت تربية مائتين وخمسين فرخ بعمر يوم واحد من سلالة Hubbard ومائتين وخمسين فرخ من سلالة Lohman التجارية. ذبحت نصف الطيور بعمر 32 يوماً والنصف الآخر بعمر 42 يوماً. تم اختيار ما مجموعه 168 جثة (84 Hubbard و 84 Lohman) بشكل عشوائي في كل يوم من المعالجة، مع تقسيم كل سلالة إلى 28 مجموعة وعمرها 0 و 4 و 24 ساعة. كان لكل سلالة متوسط وزن أسبوعي مقارن. أظهرت طيور سلالة Hubbard كفاءة تحويل غذائي للعلف أكبر خلال الأسبوعين الثاني والثالث من العمر ($P \geq 0.05$). كان لعمر الطائر تأثير معنوي ($P \geq 0.05$) على الرقم الهيدروجيني الأولي للذبيحة، مع وجود قيم أقل من الرقم الهيدروجيني للطيور التي كان عمرها 32 يوماً (عمرها 42 يوماً). كانت درجة حرارة لذبيحة سلالة Lohman أعلى من درجة حرارة لسلالة Hubbard عند صفر ساعة و 2 ساعة و 4 ساعات بمستوى معنوية ($P \geq 0.001$). كانت درجة حرارة الصدر أقل في الطيور الأصغر عمراً خلال جميع فترات تقييم الذباج عند ($P \geq 0.001$). لم يكن للإجهاد والعمر أي تأثير على فقدان من الذوبان وفقدان السوائل عند الطهي والقدرة على الاحتفاظ بالمياه. كانت لحوم سلالة Lohman أكثر طراوة ($P \geq 0.05$) من لحوم سلالة Hubbard، ومع تقدم عمر دجاج التسمين في العمر، تحسنت طراوة اللحم أيضاً. أنتجت سلالة Hubbard لحوماً ذات لوناً احمر وأقل احمراراً من سلالة Lohman، والتي جاءت من طيور أكبر عمراً. أشارت النتائج أن خصائص جودة لحوم الصدر كانت الأكثر تأثراً بالإجهاد، والعمر عند الذبح، وفترة الشيخوخة، ويمكن الحصول على شرائح أكثر طراوة عن طريق النضج لمدة 4 ساعات قبل التبريد.

كلمات مفتاحية: الطراوة، كفاءة التحويل الغذائي، الذبيحة، الاس الهيدروجيني

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INTRODUCTION

Chicken meat production throughout the globe has increased and held steady over the last several decades. Currently, chicken production is second only to that of pigs as a global source of meat supply. The same time, the market for processed goods and poultry byproducts has exploded (1). The percentage of the population that eats meat has increased in Arab country during the last several decades. Growth performance, carcass output, and carcass composition advancements have had a significant impact on the poultry farming industry. Broiler chickens meats sold today are the result of years from selective breeding for speed of development and aesthetics (especially in the breast muscles). Given that the chicken breast is the most prized part of the birds, even little variations in breast output across strain crosses might have substantial economic repercussions. That's why the broiler business is continually trying to assess the performance of commercially available strain crosses, with a special emphasis on growth and yields of lean breast meat (1). Several factors could be influence the quantity and quality of meat produced and other elements of the animal's existence. The role of variables such as stress, diet, age, BMI, and sex cannot be overstated (2, 3, 4). Authors disagree on what elements most heavily influence the final product's color, softness, cooking loss, water-holding capacity, and pH, but most agree that broiler strain, age at slaughter, and post-chilling aging are crucial. (5, 6, 7). As the markets for cut-up and downstream processing have expanded, shorter aging durations have been used to maximize processing efficiency (6). ATP is depleted and rigor mortis is brought to a close by aging, the practice of holding complete carcasses or breast halves at a cooled temperature (4°C) for many hours before deboning (8). In the commercial sector, deboning has been done as soon as 2 hours after death, and this trend toward faster processing times are expected to continue. Some suggest aging corpses for 4–6 hours to allow rigor mortis to soften the meat after deboning, which could be cause the sarcomeres in the muscle to shorten and make the meat tough (9,10,11). This Study was aimed to determine the impact of broiler age

and strain on broiler performance, and impacts of post-chilling aging on carcass and meat quality measures.

MATERIALS AND METHODS

BROILERS AND DIETS

Important broiler meat quality indicators were examined of between the Hubbard classic and Lohman commercial strains, and the impacts of strain, slaughter age, and PC aging duration were investigated. Two hundred and fifty birds of five different strains were obtained from a commercial hatchery and reared in a commercial environment until they were mature enough to be sold. At one day old, the baby birds were separated and put in 20 by 1.75 meter floor cages with wood shavings (10 pens each strain, 25 birds per pen). These enclosures had no walls on the ground floor. The productivity of a single pen was used as a yardstick. During this period of growth, the birds had access to an endless supply of food and water, as well as continual illumination consisting of 23 hours of daylight and 1 hour of darkness. During the whole study, the birds were given a diet contain 3150 Kcal ME of maize and 22.8% CP of soybean meal (3,220 Kcal ME, 20.7 % CP from 21 to 41 days) as in National Research Council recommendations served as inspiration for the diet plans (12). The first diet is composed of 58% yellow maize, 28% soybean meal, 10%, 3% vegetable oil, 0.3% DCP, 0.5% limestone, 0.1% methionine, 1.1% lysine, 0.5% DCP, and 1.1% lysine. To calculate feed conversion ratios (FCRs) average daily growth rates (ADRs) and daily feed intake was recorded, mortality, and live weight were collected from animals 1, 7, 14, 21, 28, 35, and 41 days old across all replicates (ADG).

SLAUGHTERING PROCEDURE

Specifically, between the ages of 32 and 42, 500 chickens were slaughtered (250 birds on each processing day). After being transported sixty miles to a processing factory, the birds spent ten hours in a well-ventilated waiting room before being killed. That entire time, the birds had nothing to eat or drink. The birds were stunned with an electrical current of around 1 amp and a fixed voltage of (50V AC) for 5 seconds using a saline stunner (33 mA). After the birds had been stunned, their carotid arteries and at least one jugular vein were cut

with a knife and they were left to bleed to death for 120 seconds. Feathers were plucked, blood was drawn, and a hand necropsy was performed on the birds before they were submerged in spinning scolders for 180 seconds. After being cooled to 4 degrees Celsius in chlorine water for 15 minutes, all bodies were dismembered and thrown away. After killing, the animals were sent to a chamber where the temperature was kept at 4 degrees Celsius and left to drip for 20 minutes. At random, 168 corpses were chosen to be processed each day (84 Hubbard and 84 Lohman). Hudspeth et al 1983 approach's called for 84 corpses from each strain to be collected and split into three lots of 28 (PC aged at 0, 4, and 24 h). Through incisions made at the proximal ends of the humeral bones, the forequarter was dissected into the wing and breast halves. Wax paper-wrapped, whole breasts from each carcass were placed on labeled plastic plates and frozen at -32 degrees Celsius. Samples were sent off for an hour to the Meat Quality Laboratory, where they underwent a series of tests to determine the product's quality.

pH AND TEMPERATURE READINGS ON THE CARCASS

Furthermore, 10 bodies were selected at random from each strain on each day of processing to test PM pH and temperature. Inserted a pH meter (pH spear huge screen, water-resistant pH/temperature tester, double injection, model 35634-40 Eurotech instruments, Malaysia) and a digital thermometer into the right pectoralis major muscle and recorded the pH and temperature at 0, 2, 4, 6, and 24 hours (Electro-term, model TM99A, cooper instrument corporation, CT, USA).

MEAT QUALITY MEASUREMENTS

The uncooked pectoralis major muscle of a broiler is tested for pH and the color coordinates L*, a*, b*. Several indicators of meat quality were tested on cooked samples, including cooking loss (CL) and Warner-Bratzler shearing force (SF). Chemical analysis was performed on eight breasts from each of the twenty-eight quail groups, for a total of twenty breasts. Breasts were frozen and then thawed overnight at 4°C in the fridge while remaining on their plates. Assessed pre-

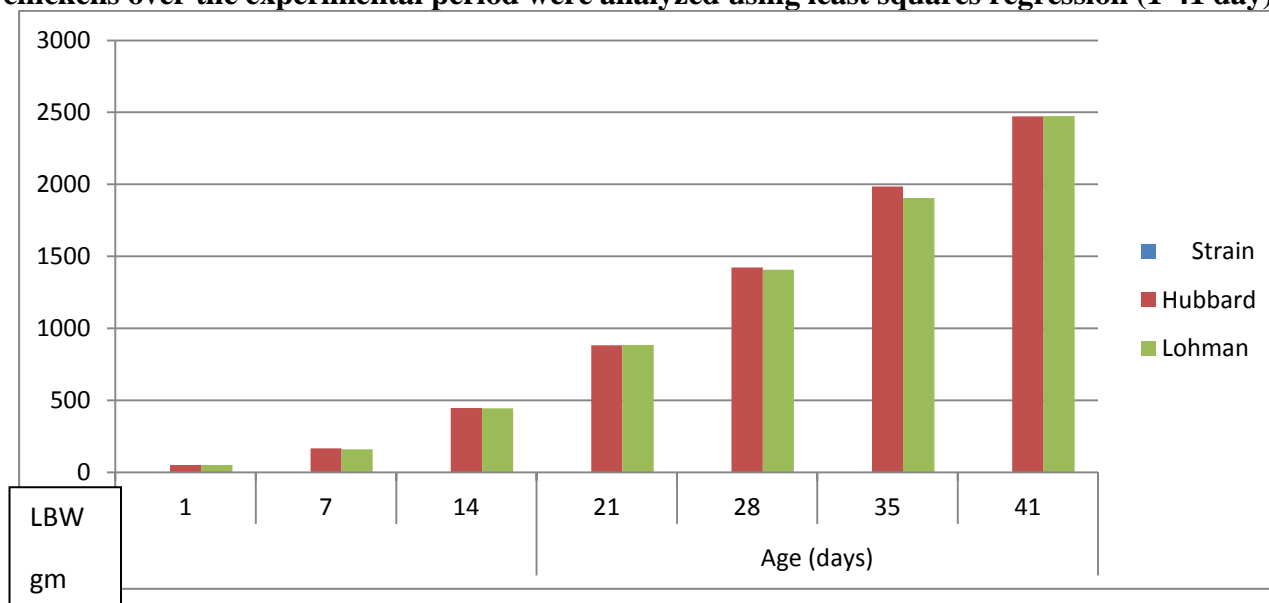
and post-freezing breast weight and manually deboned both pectoral muscles using the Hamm method (13). The breast tissue was dislodged from the humeral-capitellar joint by applying downward pressure on the pectoral muscles after the skin had been removed. The identical pectoral muscle that was randomly picked for the color, pH, and WHC tests also underwent the CL and SF examinations. pH was calculated using the iodoacetate technique, as shown in Equation (14,15,8). The effects of iodoacetate and KCl on the pH of the pectoralis major muscle were investigated by homogenizing raw meat samples taken at 0, 4, and 24 hours. (IKA Labortechnik's Ultra-Turrax T8, Janke & Kunkal GmbH & Co. The solution's pH was tested using a pH meter. Defrost muscles overnight at 4°C. Muscle color was researched. Slices were thawed for 24 hours, then placed on polystyrene plates and maintained at 4°C for 3 hours. Lightness (L*), redness (a*), and yellowness (b*) on the CIELAB scale were assessed (12MM Aperture U 59730-30, Cole-Parameter International, Accuracy Microsensors Inc. Pittsford – New York, USA). (a^*2+b^*2) was used to determine the hue angle from (b^*/a^*) 1/2 determines chroma (16). The three samples on the skinless surface all exhibited normal color and no bruising or damaged blood vessels. We evaluated how much fluid pectoralis major muscles released in reaction to external force and how well protein held water in excess and under internal stress (expressible juice). The raw meat samples were extracted by pressing them for 5 minutes between two filter papers (185 mm circles with fine crystal retention, Whatman International Ltd. England) and two thin quartz plates, as described by (17) with a little modification by (18). (Mass loss) The percentage of water retention was estimated by dividing weight lost after pressing by sample's initial weight. Deboned pecs were inserted in polyethylene bags with beginning weights. After 25 minutes at 85°C, samples reached 80°C. After cooling, the caps were removed and the contents evacuated. We reweighed the cooked sample after paper toweling it. Cooking loss was estimated by dividing cooking weight loss by the sample's pre-cooking weight. Tenderness was measured

from CL samples. After the muscle samples had dried for three hours, they were sectioned lengthwise into six cores with consistent diameters (20 mm, 13 mm, and 13 mm). Each core was sheared perpendicular to the direction of the muscle fibers using a Warner-Bratzler shear blade with a triangular slot cutting edge, placed on a Salter model 235, to determine the maximum force (in kilograms) (Warner-Bratzler meat shear, G-R manufacturing Co. 1317 Collins LN, Manhattan, Kansas, 66502, USA). In order to calculate the shear force, we averaged the six greatest readings we could find.

STATISTICAL ANALYSIS

The data in a 223-factorial design was

Diagram 1. Changes in average live body weights (g) of Hubbard and Lohman broiler chickens over the experimental period were analyzed using least squares regression (1-41 day).



Means within the same column with different superscripts differ according to the indicated level of significance. NS = Non significant; * $p \geq 0.05$.

The relative live weights of Hubbard and Lohman birds did not differ statistically ($P \geq 0.05$). A Hubbard LBW was greater than a Lohman bird's at 7 days of age ($P \geq 0.05$). Between 14 and 28 days of age, the strains did not vary significantly ($P \geq 0.05$) in live LBW. By the 35th day, Hubbard's live body weight had surpassed Lohman's. Live body weight was not significantly ($P \geq 0.05$) different between the two strains at the conclusion of the experiment. The researcher were consistent with those of a previous research that compared the five most common chicken breeds and discovered age-related disparities in live body weight among the differenced broiler breeds. However, there was no

noticeable variation in average LBW across strains at 7 weeks of age. There was no statistically significant difference in ultimate body weight (LBW) between commercial broilers strains at 42 days of age, as reported by investigations (20, 21), respectively. The average daily feed intake (1-41 days) of Hubbard and Lohman broiler are shown in Diagram 2. Hubbard broiler, on average, ate more than Lohman birds every day of the week except the week before. Hubbard birds consumed about 1.1 g more feed than Lohman birds during the first week, 2.5 g during the second week, and 3.7 g during the third week ($P \geq 0.05$). While the fourth week, there was no difference in the quantity of feed eaten by

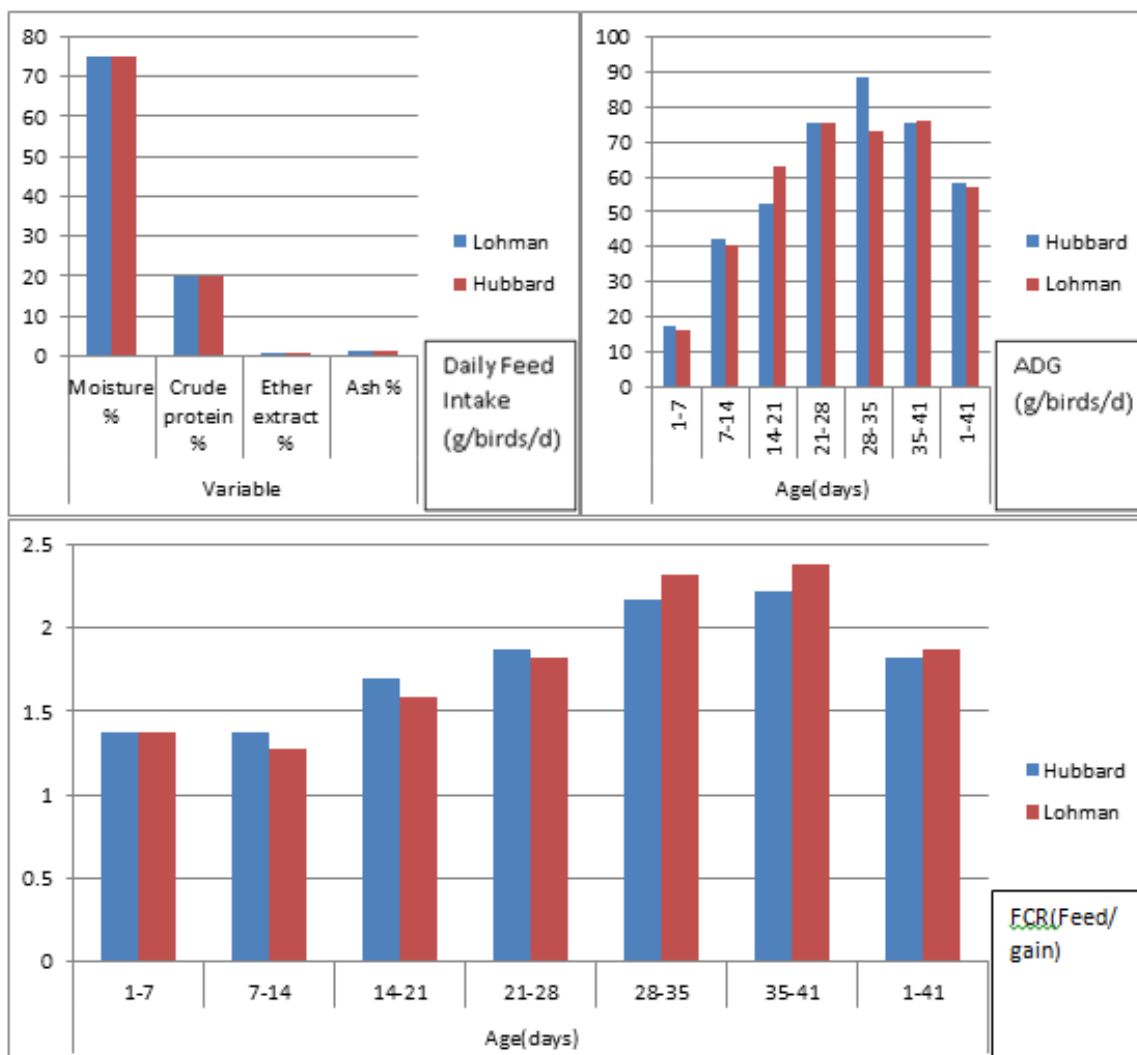
RESULTS AND DISCUSSION GROWTH PERFORMANCE

The changes in live body weight (LBW) of Hubbard and Lohman broiler at 1,7,14,21,28,35 and 41 days of age are presented in Diagram 1.

Hubbard and Lohman broilers. In comparison to the Lohman birds, the Hubbard broilers consumed 16.3 g more feed at week 5. Lohman broilers consumed 19.8 more grams of feed than Hubbard broilers did during the

last week ($P \geq 0.001$). The daily food consumption of Lohman and Hubbard birds was quite comparable, at 106 g ($P \geq 0.05$). These results agree with those reported by (20).

Diagram 2. Lohman and Hubbard broiler chickens were reared using least-squares means of feed intake, average daily gain (ADG), and feed conversion ratio (FCR) (1-41 day)



Means within the same column with different superscripts differ according to the indicated level of significance within each main effect. NS = Non significant; * $p \geq 0.05$; ** $p \geq 0.01$; *** $p \geq 0.001$.

Other researchers (22) discovered non-significant difference in the total amount of feed consumed by three different breeds of broilers. Experiments showed that the quantity of feed consumed by different breeds varied greatly, however not between the Hubbard and Lohman kinds (22). The Hubbard and Lohman birds did not differ significantly in performance from one another, with the exception of the first and fifth weeks of age, when they exhibited significantly different average daily improvements (Diagram 2). Lohman gained less weight in one week than Hubbard ($P \geq 0.01$). Hubbard birds had a

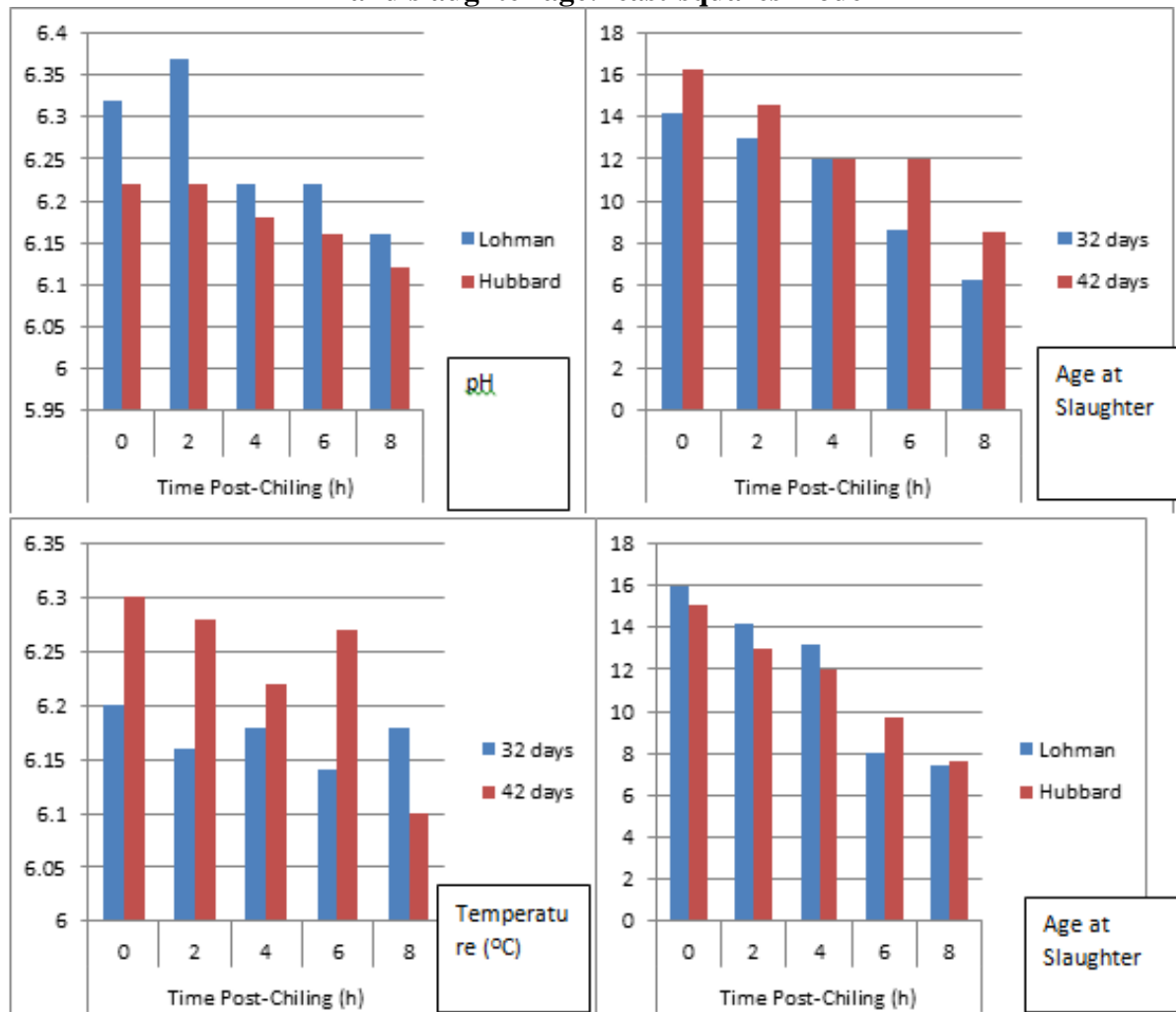
greater weight growth during 5 weeks compared to Lohman birds ($P \geq 0.01$). Daily bird counts for the Hubbard and Lohman species were quite similar (ADGs). No significant difference in total ADG were found between the Hubbard classic and Lohman strains (22). Three distinct broiler breeds showed drastically varied total ADG (weeks 1-6) at ($P \geq 0.05$). In the 2nd and 3rd weeks at ($P \geq 0.05$ and $P \geq 0.01$, respectively). The feed conversion ratio (g of feed/g of gain) was considerably higher in Hubbard birds than in Lohman birds (Table 2). From week 1 through week 6 and overall, the FCR in Hubbard and

Lohman birds was statistically equivalent ($p>0.05$). Hubbard classic and Lohman strains were found to have similar total FCRs, as reported (22).

CARCASS pH AND TEMPERATURE AFTER CHILLING: Diagram 3 shows the effects of stress and age on the pH of breast muscle in PC carcasses. Breast tissue pH was evaluated immediately after collection and

again at 2, 4, 6, and 24 hours (PC). Zero, two, four, six, and twenty-four hours post-cultivation showed no significant changes in pH value due to the strain. Even though the Lohman strain of broilers had higher pH values than the Hubbard strain, the difference were not statistically significant ($p>0.05$) across all PC sampling intervals.

Diagram 3. pH and temperature of broiler breast post-chill carcasses as impacted by strain and slaughter age: least-squares model



Means within the same column with different superscripts differ according to the indicated level of significance within each main effect. NS = Non significant; * $p\geq0.05$; ** $p\geq0.01$; *** $p\geq0.001$

An examination of breed's influence on broiler performance and meat quality found no statistically significant differences in Pectoris major muscle pH among breeds during PM (23). (0.25, 4, or 24 h). Strain affected PM pH at 2 and 4 h PM (6). Bird strain affects broiler breast meat acidity (7, 8). This experiment demonstrated no significant variations in LBW between the two broiler strains, despite differences in PC pH. Multiple studies suggest that slow-growing chickens have lower breast pH. (24). Diagram 3 compares pH

measurements throughout slaughter ages and indicates that breast muscle pH declines considerably ($p>0.05$) during all PC durations except 0 h. After 2 hours ($P\geq0.05$), 4 hours ($P\geq0.05$), and 6 hours, PC pH values of 42-day-old chickens were significantly higher than those of 32-day-old birds ($P\geq0.001$). 32-day-old birds had a higher PC pH than 42-day-old birds ($P\geq0.01$). Both the initial pH (0 h) and final pH (24 h) altered as the birds aged. Researchers (reference 23) found that 53-day-old broilers had a higher pH than 42-day-old

broilers. 53-day-old broilers had a lower pH 24 hours postmortem than 42-day-old broilers. 42-day-old chickens had lower muscle pH 0.25 and 4 h postmortem than 53-day-old fowl. These results support the concept that pH drop rates reflect PM metabolism in skeletal muscle. As birds age, breast muscle pH decreases more quickly. PM pH fluctuations were more apparent with increasing age at slaughter, indicating environmental circumstances before or on the day of processing contributed. Figure 1A demonstrates that after 4 hours of PC, breast pH declines by strain and slaughter age. Hubbard broilers' pH declined as they matured, but Lohman's rose. Table 3 shows the effects of strain and age on breast temperature at 0, 2, 4, 6, and 24 PC. Lohman and Hubbard breast flesh temperatures were different at all PC durations other than 24 h. Lohman's breast was warmer at 0 hours, 2 hours, and 4 hours post-cook. PC Hubbard breast meat was hotter six hours after cooking than Lohman. (26), a commercial strain with high breast meat yield, showed greater temperatures at 0.25 and 1 h PM than the control strain. 0.2, 4 and 24 hours post-menstruation, researchers discovered no statistically significant differences between Lohman and Hubbard (23). There are no significant differences in breast muscle temperature between animals of different ages at slaughter over the 4 h PC period (Diagram 3). At 0, 2, 6, and 24 hours after slaughter, breast temperatures of 42-year-old chickens were considerably ($P \geq 0.001$) higher than those of 32-days-old (PC). This pattern of results is reasonable given Hector's comments (23). Breast muscle temperature fluctuated greatly over all three PM recordings, perhaps due to the animal's elderly age (0.25, 4 and 24 PM). Later-aged birds had lower breast temperatures, maybe because they weighed more. Due to strain by slaughter age interaction, breast muscle temperatures at 0, 2, 4, and 24 hours post-mortem varied greatly. 32-day-old Lohman birds had colder breast muscles than Hubbard birds. Hubbard's 42-day breast muscle temperature was lower than Lohman's. As the animals matured before slaughter, the 24 h PC breast muscle temperature climbed in both strains. Lohman chicks' breast muscle temperature was lower

than Hubbard chicks' at 32 days. Between days 32 and 42, Lohman's breast muscle temperature climbed more than Hubbard's.

INITIAL AND POST-THAWING BREAST WEIGHTS AND THAWING LOSS PERCENTAGE:

Data in diagram 4 illustrates the relationships between stress, age, and the duration of maturing on breast weight and the proportion of weight loss due to thawing. Hubbard birds' breasts were thicker than Lohman birds' both before and after freezing ($P \geq 0.001$). Additionally, thawing loss as a percentage did not affected by strain ($p > 0.05$). On the other hand, the starting and final breast weight of chickens killed at 42 days of age was greater than that of chicks murdered at 32 days of age ($P \geq 0.001$). As women became older, their breasts would naturally become bigger as a side effect of aging. The percentage of freezing loss for chickens butchered at 32 days of age or 42 days of age was the same. Age did not had a role in either the percentage of breast tissue lost during thawing or the difference between pre- and post-thawing weights (0, 4 and 24 h). Due to strain-age relationship, there was a significant difference in breast weight between the two groups. At 32 days of age, the breast muscles of Hubbard and Lohman birds were of equal weights. When compared to Lohman chicks, Hubbard birds were much heavier after 42 days ($P \geq 0.001$).

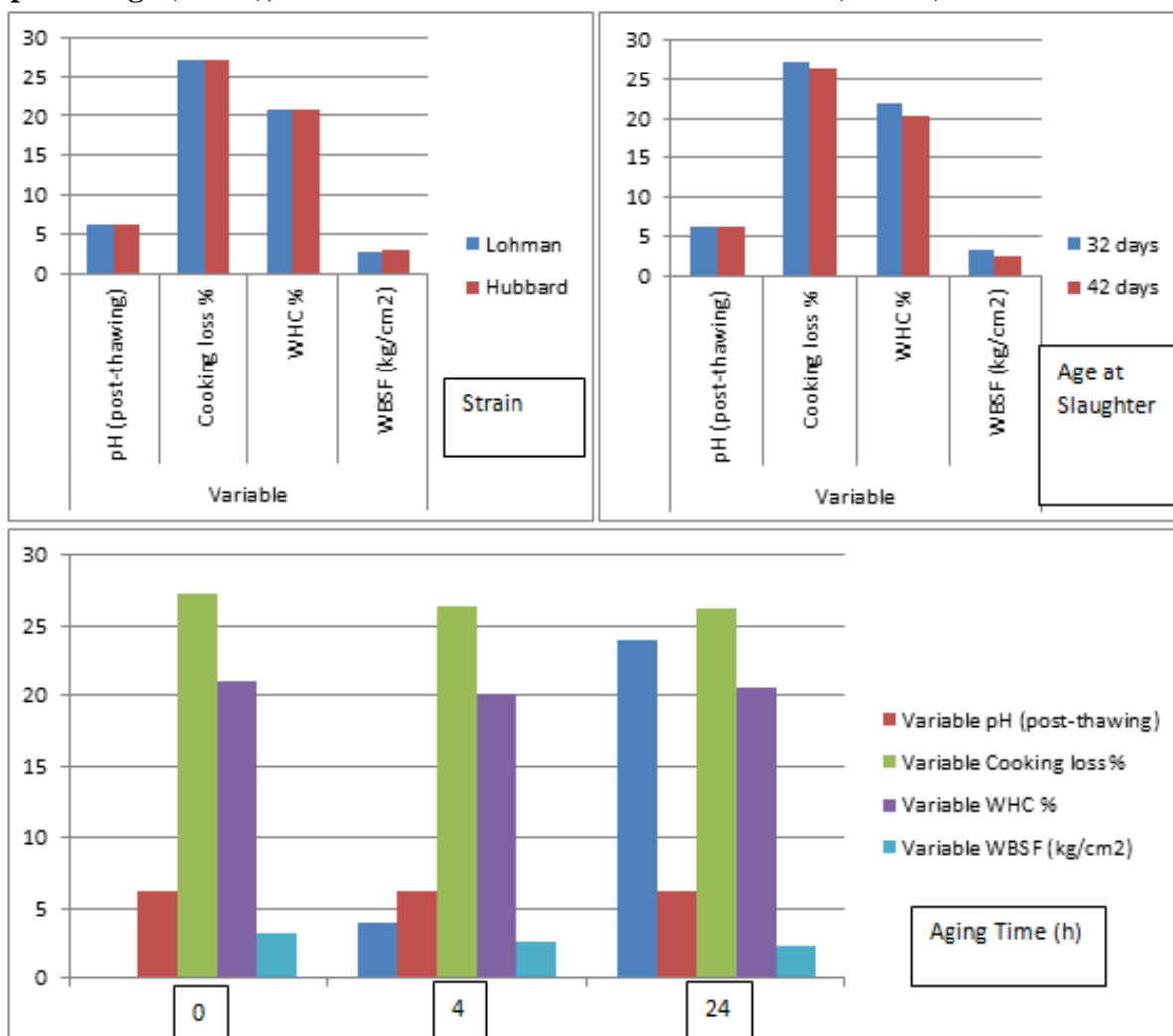
POST-THAWING PH, CL PERCENTAGE, WHC PERCENTAGE AND SF VALUES OF BREAST MUSCLE:

According to Diagram 4, there is no strain-specific thawing-induced change in pH ($P \geq 0.05$). There was no correlation between slaughter age and post-thawing pH ($P \geq 0.05$) or between slaughter age and aging time. Significant differences were found between the pH levels of 32-day-old and 42-day-old dead birds. Compared to newly isolated breast muscle, breast muscle that had been cultivated in isolation for four hours or more exhibited significantly lower pH values ($P \geq 0.05$). There was no significant difference ($P \geq 0.05$) in WHC or CL percentages between strains that were either younger or older when slaughtered (Diagram 4). Results showed no significant differences in WHC and CL percentages across breeds, slaughter ages, or aging times

(6, 27, 28) Over time, however, we observed a rise in the CL content of broiler breast muscle (29, 30). Changes in breast muscle pH were shown to worsen with increasing age. Researcher (31) demonstrates, however, that the CL % of broiler chicken breast meat decreases dramatically as the birds age.

Muscle fat increases as birds age, reducing their lean body mass but increasing their WHC and CL percentages. There was no significant correlation between slaughter age and either WHC or CL ($P \geq 0.05$). In light of this, it seems that birds of both 32- and 42-day-olds may be murdered with equal success.

Diagram 4. Using least squares methods, we examined the effects of strain, slaughter age, and aging time on the pH (post-thawing), cooking loss percentage, water holding capacity percentage (WHC), and Warner-Bratzler shear force values (WBSF) of broiler breast



Means within the same column with different superscripts differ according to the indicated level of significance within each main effect

NS = Non significant; * $p \geq 0.05$; ** $p \geq 0.01$; *** $p \geq 0.001$

The SF value of Hubbard breast meat was lower than that of Lohman breast meat ($P \geq 0.05$). (Diagram 5) . Lohman and Hubbard birds typically had SF values of 2.56 (kg/cm²) and 2.81 (kg/cm²), respectively. The bulk of studies on the topic of what kind of bird breed produces the most delicate broiler breast flesh have come to the same conclusion (32,6,7). The shear force values (3.03 and 2.34 (kg/cm²)) of birds died at ages 32 and 42 days were different significantly. The SF content of

turkey breasts was observed to be significantly lower as the birds matured from 16 to 20 weeks (33) It seems that the findings support the hypothesis. With age, the cross section of muscle fibers grows. The manufacture of enormous fibers, which have a cross-sectional area three to five times that of regular fibers, had increased in recent days (34). There's some evidence to suggest that the muscles of younger birds that are slaughtered are more compact and resistant to harm because their

fiber diameters are smaller. Similar SF values were found in fillets taken from 37-day-old, 49-day-old, and 51-day-old broilers, as well as 39-day-old, 42-day-old, 44-day-old, and 46-day-old birds. Broiler breast fillets were examined for tenderness, and it was found that the Warner-Bratzler SF values rose with age, from 5 to 8 weeks old. There was no change in breast meat softness between 63 and 68 day old broilers (9). Since there was likely not much of a time gap between when the animals were born and when they were slaughtered, this may have been the case. This research demonstrated a much lower shear force value compared to earlier publications (28, 29, 5). Could be due the birds used in the studies grown up so quickly. The fast development of broiler chickens has led to the production of more delicate meat, as described by (34). Birds' ages, the muscles they used, and their family trees were all thought to have a role in how much pain they experienced. Lengthen the period between slaughter and deboning for juicier, more flavorful meat (9, 36). As predicted, SF levels in 4- and 24-hour-aged meat were much lower than those in raw meat ($P \geq 0.001$) (Diagram 4). Shear force readings decreased from 3.17 kg/cm² to 2.21 kg/cm² after 24 hours. Our findings corroborate the findings of other studies showing a decline in SF values as PCs age (27, 37, 6). Tenderness is greatly impacted by the enzymatic changes that occur in aged meat. It was hypothesized that enzymes breaking down muscle tissue contributed to the felt elevation of pain. Proteases, such as chapsin's and others, are found throughout the body and function to degrade enzymes (38). In the 24 hours after slaughter, muscular discomfort diminishes considerably, according to studies. This loss of sensitivity is mostly due to the shortening of sarcomeres. The combination of strain and age resulted in a wide range of SF values. At zero hours of age, shear force values for Hubbard breast flesh were greater than those for Lohman. There was a significant difference in the SF values of Hubbard and Lohman breast meat at the same age, with the latter having lower values after the meat had just been matured for 4 hours. After 24 hours, the SF values of Hubbard breast meat were higher than those of Lohman. There were different

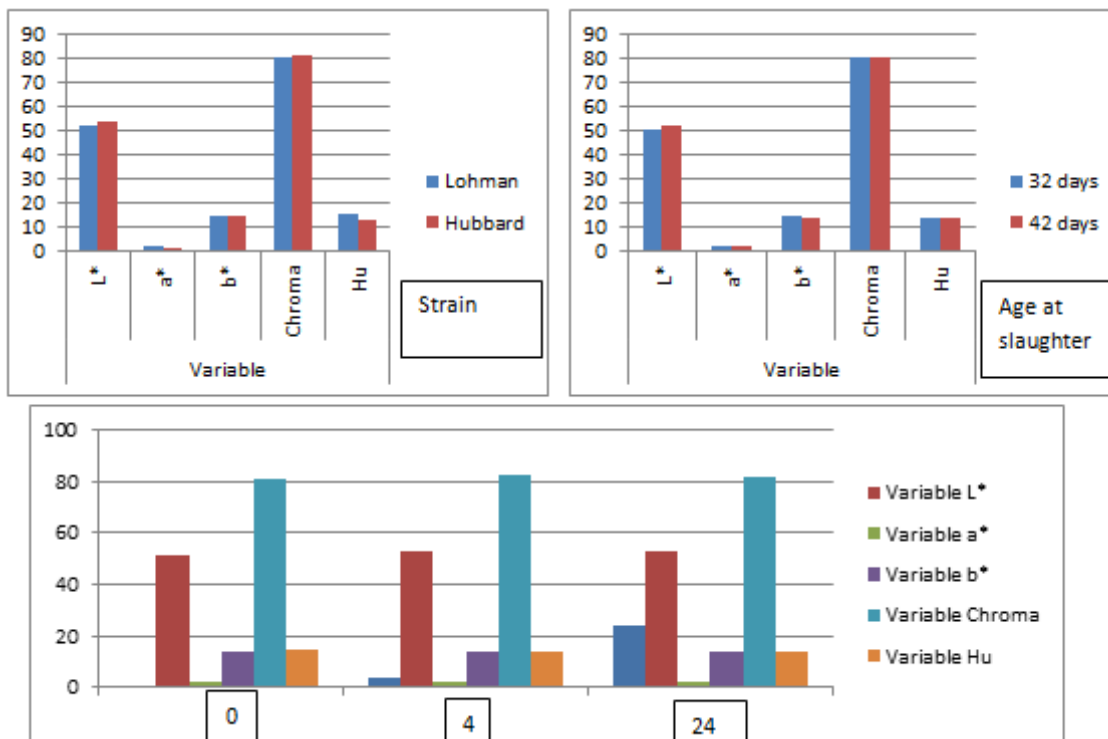
significant ($P \geq 0.001$) associations between age and SF values. Scientists (38) found that chicken breast meat taken at 32 days of age had greater SF values than meat harvested at 42 days of age. Mortal SF values of chickens slaughtered at 32 and 42 days old were equal (2.8 kg/cm²). Reduced SF values of breast meat were seen in both the 32-day-old and 42-day-old slaughtered groups. Meat from chickens slaughtered at 42 days had lower SF values after 24 hours compared to meat from chickens slaughtered at 32 days.

BREAST MUSCLE COLOR MEASUREMENTS: From the data in diagram 5, could be observe how the breast color measures change according on the strain, slaughter age, and aging period. There was a significant relationship between strain and luminance (L^*), color temperature (a^*), and Chroma ($P \geq 0.05$). When comparing Lohman and Hubbard breast meat, the L^* values were lower in the Lohman. A Hubbard bird's average L^* was 53.32, whereas a Lohman bird's average L^* was just 51.14. L^* values for broiler breast fillets ranged from 43.5 to 51.5 points, with an average of 47. (39). the average L^* values and their findings are quite different, however (40) did find L^* values between 45.0 and 67.3. According to, L^* values varied widely across strains (23). When compared to Hubbard chickens, Lohman chickens exhibited pinker (a^*) breast meat. Neither b^* nor Hue has undergone any significant alterations as of yet. Breast tissue from Lohman and Hubbard women had the same pH, therefore it seemed unlikely that strain was responsible for the observed color difference. Light scattering and skin color change when the skin's pH decreases due to denatured sarcoplasmic proteins (41). There was a correlation between increased L^* and lower end-muscle pH. (42). Age at slaughter had no effect on the breast meat's hue, chroma, or redness (Table 5). Breast meat from hens aged 32 days had considerably lower L^* values than meat from chicks aged 42 days ($P \geq 0.05$). While the red and yellow hues of a turkey's breast tissue do not change throughout this time period (between 16 and 20 weeks), the white tissue does (33). Analysis of broiler chickens of several ages revealed differences in the color of their breast meat (days 35-42). (43). There

was no correlation between age and skin tone in the breasts. Because birds murdered at 42 days had lower ($P \geq 0.05$) ultimate pH values than hens slaughtered at 32 days, L^* values

shifted as expected. Having a low pH in the muscle in its ultimate state has been shown to raise L^* levels. (42)

Diagram 5. As influenced by strain, slaughter age and aging period for broiler breast color measurements. Least squares means



Means within the same column with different superscripts differ according to the indicated level of significance within each main effect

NS = Non significant; * $p \geq 0.05$

No color metrics are significantly altered by age ($P \geq 0.05$) (Diagram 6). Brightness was 51.35 after 0 h PM and 52.55 after 24 h PC; the difference was not different significantly. Previous research suggesting that aging greatly affected meat color (44, 27) was revealed to be incorrect. There was no indication of an interaction in any of the color data ($P \geq 0.05$). Meat's color might seem varied depending on the angle of reflection due to differences in pigment level and chemical condition.

CHEMICAL COMPOSITION OF BREAST MEAT: It's important to note that moisture levels in breast muscle, ether extract, and ash% were not influenced by strain or slaughter age. (Diagram 6) . When looking at the % of crude protein, however, there was no association between age at slaughter and the findings ($P \geq 0.05$). Crude protein level was greater in breast meat from 32-day-old chickens than it was from 42-day-old birds ($P \geq 0.05$). Our findings, which are in line with those of 45 other research, provide a consistent

picture of the chemical composition of breast tissue. Comparison of the Lohman and Hubbard classic broiler strains revealed statistically significant variations in moisture, crude protein, and ash percent ($P \geq 0.05$), but no changes in ether extract percent. Researchers observed no variations in breast meat composition (moisture, protein, and fat) across the three broiler strains ($P \geq 0.05$). Chickens of 32 and 42 days of age may have similar chemical compositions in the breast flesh.

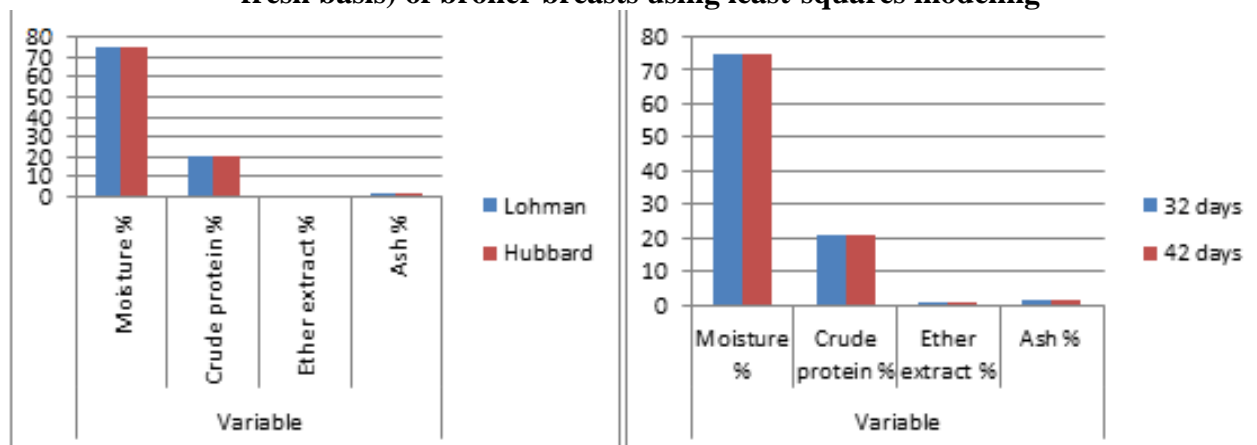
CONCLUSION

There was no significant difference in live weight between the strains outside of the two-to five-week time window. The FCR was comparable across the two strains overall, but greater in Lohman between weeks 2 and 3. While the Hubbard strain's breasts were heavier pre- and post-thaw, lighter in color, and firmer in texture than the Lohman strain's, the two strains had similar thawing loss, WHC, and CL percentages. The breast weight,

lightness of flesh, and softness of birds that were slaughtered at age 42 were all better than those of younger birds, whereas the thawing loss, white meat health content (WHC), and carcass leanness (CL) percentages were all comparable. Both types of chickens developed tenderer breast flesh as they aged before slaughter. Four hours later, the flesh had become significantly tender. The breast flesh from Lohman carcasses is somewhat tenderer

than that from Hubbard carcasses, while the meat from 42-day-old birds is softer than that from 32-day-old birds. Therefore, the strain, age at slaughter, and PC aging duration are critical to breast meat quality traits and aging for 4 h before to deboning is required to generate more tender fillets. Any poultry processing plant might use information like this.

Diagram 6. The effect of strain and slaughter age on the chemical composition percent (on a fresh basis) of broiler breasts using least-squares modeling



Means within the same column with different superscripts differ according to the indicated level of significance within each main effect

NS = Non significant; * $p \geq 0.05$

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