Performance and Quality of Pasture-raised Poultry: Label Rouge - Type

Final Report for GS03-029

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Project Information

Summary:

Consumer interest in natural and organic poultry is growing. An experiment was conducted to assess the impact of alternative genotype, production system, and nutrition on growth performance, carcass yield, meat quality, and sensory attributes of broilers for natural or specialty markets. A slow-growing genotype (Slow) and a commercial fast-growing genotype (Fast) were raised were raised for 91 and 63 days, respectively. Each genotype was assigned to four pens of 20 birds each and raised in indoor floor pens in a naturally ventilated facility; each genotype was also assigned to four floor pens in a small portable facility with outdoor access (during daylight hours). The Fast birds were provided with a 3-phase diet and the Slow birds were provided with a 4-phase diet. The feeds were formulated to be low in energy and protein for a slower rate of production as in the French Label Rouge program. Birds were commercially processed and deboned at 4 h postmortem. The F birds gained more weight than the S birds ($P < 0.05$) even though they were placed 4 weeks later. The outdoor birds had a higher feed intake than indoor ($P < 0.05$), and consequently a poorer feed efficiency ($P < 0.05$). The F birds had a higher breast yield ($P < 0.05$), while the S birds had a higher wing and leg yield ($P < 0.05$) as a percent of body weight. The meat of the S birds became more yellow (higher b*) when the birds had outdoor access; however, this did not occur when the F birds had outdoor access ($P < 0.05$). The breast meat of the S birds had less fat than the F birds, with only one half the amount of fat of the F birds ($P < 0.05$). Production system had an impact on protein, with the outdoor birds having less fat than the indoor birds ($P < 0.05$). The S birds were more tender than the F birds ($P < 0.05$). A trained panel detected small differences in texture and flavor between conventional and alternative products, but the consumer panel did not indicate differences in liking. An additional experiment examined the impact of genotype and nutrition on performance and quality. The diets compared were low protein/low energy (Low) and regular protein/regular energy (Reg). The Low diet was the same one used in Exp. 1 and the Reg diet was formulated to contain adequate nutrient levels as defined by the NRC (1994). The Slow birds increased in mean weight when fed the

Reg diet compared to the Low diet; however, this effect was not seen in the Fast birds. These data indicate that performance and meat quality differences exist among genotypes with different growth rates and reared in alternative production systems with differing diets.

Introduction

There is interest in natural and organic poultry that have been raised with access to the outdoors. Small farmers, in particular, raise small flocks to boost farm income, contributing to rural development. Production systems vary, depending on size. Small farmers usually use small portable houses or field pens that are moved regularly to fresh pasture. Larger companies typically use stationary houses that open to enclosed yards.

Research is needed on the performance and quality of birds raised in alternative production systems. Many small farmers believe that the meat has superior nutritional content and sensory attributes compared to conventional poultry meat, and scientific research is needed to investigate the differences.

Fast-growing birds are generally used in alternative production systems in the U.S. However, fast-growing birds have been selected for indoor production and are likely to be more adapted to conventional systems. Fast-growing birds are a Cornish x White Rock cross and have been selected for decades for fast growth and high yield of breast meat. They reach a market weight in about 7 weeks. However, fast-growing birds are not active breeds compared to slower-growing birds. In addition, low lighting levels are used in indoor production systems to keep birds calm and encourage growth, but low lighting also discourages activity and exercise. Slow-growing birds take much longer to reach market weight--about 12 weeks--and medium-growing birds are intermediate, reaching market weight in 10 weeks. But slow-growing birds are hardy and do not tend to have the metabolic problems such as ascites and sudden death syndrome that is seen in fast-growing birds.

In Europe, slow-growing birds are used in organic production. In fact, organic chickens are required to have an 81-day grow out. In the French Label Rouge program, which makes up 30% of poultry production in France, slow-growing birds are required. Under the Label Rouge program, slow-growing birds are raised with access to the outdoors, fed low protein/low energy diets that support a slower rate of gain than conventional birds, and, at processing, are air chilled rather than immersion chilled, which is the prevailing method used in the U.S. The meat from Label Rouge birds is considered more firm and flavorful than conventional poultry meat and sells at twice the price of conventional. Slow-growing birds are not commonly used in the U.S., in fact, there is little availability. Europe is the leader in providing specialty genetics for commercial production.

Although small producers have been meeting niche market demands in the U.S., increasingly, large companies are beginning to produce for antibiotic-free, natural, free-range, and organic markets. Small farmers need to stay abreast of niche opportunities in order to compete with businesses with large-scale efficiencies. Evaluating specialty pasture-raised poultry products could help small producers with their marketing efforts. The use of appropriate genetics would be expected to improve production and further differentiate the product in the marketplace.

Project Objectives:

Assess the impact of genotype, production system, and nutrition on performance, carcass yield, meat quality, and sensory attributes.

Research

Materials and methods:

Exp 1: Genotype/Production System Trial: A trial was conducted at the University of Arkansas Poultry Research Farm from August to November 2004 to assess the impact of alternative genotypes and production systems on growth performance, carcass yield, meat quality, and sensory attributes. Two production systems were compared in this study: indoor vs. access to the outdoors. Two genotypes were also compared, and were categorized with regard to the approximate time required to reach a market weight of 2.0-2.5 kg. The genotypes included one slow-growing broiler (Slow) (Free-Range Broiler from S & G Poultry, Clanton, AL) and a commercial fast-growing broiler (Fast) (Cobb-Vantress, Inc., Siloam Spring, AR), which were raised for 91 or 63 d, respectively. The four treatments were therefore Slow-Out, Slow-In, Fast-Out, and Fast-In. In designing the trial, it was decided that a similar final body weight was desirable. Therefore, the placement dates were staggered in an attempt to reach similar body weights at trial termination such that all genotypes could be processed on the same day. Only females were used. Each genotype was assigned to four replicate pens of 20 birds each (80 birds per treatment) and raised in indoor floor pens in a naturally ventilated facility; each genotype was also assigned to four floor pens in a small portable facility with outdoor access. Pens in both the alternative outdoor facility and the conventional indoor facility were randomly assigned.

The alternative production facility was established in August 2004 at the University of Arkansas Poultry Research Farm. It was designed to be a type of production system favored by small growers—commonly called “day-range.” A 12 ft. x 18 ft. portable house was constructed. The house was wood framed, covered with sheet metal, and insulated. The wood floor was built in removable panels and was covered with fresh pine shavings. Natural ventilation was used with two air inlets to allow fresh air to enter the building. A 6-ft ceiling allowed air differential for warm air to rise and exit through two whirlybirds on the roof. Windows spanning the sides of the building opened to provide additional ventilation during warm weather. Doorways on each end of the building allowed access by personnel. Small bird doorways allowed access to grassy yards during daytime hours. Birds were enclosed in the house at night. The building had no access to power because it was portable. The house was designed to be moved after every grow-out. Lighting was natural. Propane space heaters were used to keep nighttime temperatures above 60 F inside the house. Bird doors were opened daily unless the temperature was less than 40 F. The house was not heated during the day when the doors were open. Electric net fencing surrounded the housing unit; the charger was powered by battery. The facility was subdivided for research. The house unit was subdivided into eight indoor pens that opened to eight separate yards subdivided with chicken wire. The indoor pens measured 4 ft/x 5 ft, and the yards were at least 100 square feet in dimension and completely covered with vegetation. Each pen contained one waterer and hanging tube feeder. Each yard contained one waterer and a range feeder with rain shield. Ground predators were excluded by electric net fencing, and overhead predators were excluded by netting over the yards. Birds were confined to pens in the housing unit at night. Outdoor access from these pens was provided after 3 wk of age during daylight hours through doorways measuring 2 ft x 1.5 ft. Chicks were brooded in an indoor facility and moved to the free-range unit at 3 weeks of age. Slow-growing chicks were placed 4 weeks before fast-growing chicks.

The indoor facility was a naturally-ventilated house at the University of Arkansas Poultry Research Farm with a concrete floor, side curtains, and equipped with fans for ventilation and cooling. A thermostatically-controlled heater was used and gas brooders along the length of the house provided additional heat during brooding. Indoor pens measured 6 ft x 6 ft and contained one plasson waterer and hanging tube feeder. Pens contained new pine wood shavings, and a constant photoperiod of 24 h was provided.

Birds were provided with multi-stage diets that were formulated to be low in protein and energy as used by the French Label Rouge program for slow-growing birds. The Fast birds were provided with a 3-phase diet and the Slow birds were provided with a 4-phase diet. The fast-growing broilers were fed a starter diet for 4 weeks, a grower I diet for 4 weeks, and a grower II diet for 1 week. The slow-growing birds were fed a starter diet for 3.5 weeks, a grower I diet for 4 weeks, a grower II diet for 2 weeks, and a finisher diet for 3 weeks. All diets were devoid of animal by-products and antibiotics; anticoccidial medication was included. Access to feed and water was freely available.

Exp. 2: Genotype/Feed Trial: An additional trial was conducted at the same time to assess the impact of genotype and diet on performance, carcass yield, and meat quality. The genotypes compared were the same as the ones described in Exp. 1 (e.g. slow-growing broiler (Slow) and a commercial fast-growing broiler (Fast), which were raised for 84 or 56 d, respectively. The diets compared were low protein/low energy (Low) and regular protein/regular energy (Reg). The Low diet was the same one used in Exp. 1 and the Reg diet was formulated to contain adequate nutrient levels as defined by the NRC (1994). The four treatments were therefore Slow-Low, Slow-Reg, Fast-Low, and Fast-Reg. Only males were used in this trial. Each treatment was represented in four replicate pens containing 20 chicks each (80 birds per treatment). All birds were housed in the indoor facility.

The fast-growing broilers were fed a starter diet for 4 weeks and a grower I diet for 4 weeks. The slow-growing birds were fed a starter diet for 3.5 weeks, a grower I diet for 4 weeks, a grower II diet for 2 weeks, and a finisher diet for 2 weeks. Again, all diets were devoid of animal by-products and antibiotics; anticoccidial medication was included. Access to feed and water was freely available.

In both trials, broilers and feed were weighed weekly for determination of weight gain, feed intake, and feed efficiency. Weight gain and feed efficiency were adjusted for mortality.

All birds were commercially processed at the University of Arkansas Pilot Processing Plant. The birds in Exp. 2 were slaughtered one week before the birds in Exp. 1. Feed was withheld for 10 h before slaughter and broilers were weighed individually at the plant. Automated equipment was used for stunning, scalding, picking, vent opening, and evisceration. Birds were electrically stunned (11 V, 11mA, 10 s). Birds were scalded at 53 C for 128 seconds. Carcasses were pre-chilled at 12 C for 15 minutes and chilled (immersion) at 1 C for 1h. After chilling, the carcasses were aged on ice for 4 hours, and chilled weight was recorded before hand deboning on a cone. Pectoralis samples were collected at 4 h postmortem for evaluation of meat quality. Yield of breast, wings, legs, and rack (frame and skin) was recorded.

Color was measured by the CIELAB method using a Minolta colorimeter. In this method, higher L* values are light, higher a* values are red, and higher b* values are yellow. Breast fillets were cooked on racks in aluminum-lined, covered pans in a preheated, convection oven to an internal temperature of 76°C. After cooking, the breasts were weighed to determine cook loss. Cook loss was determined by calculating the weight loss during cooking as a percentage of the weight before cooking.

Razor blade shear energy (N*mm) was determined on intact fillets with an average height of 20 mm in duplicate. Energy was determined using a Texture Analyzer (Cavitt et al., 2004). Breasts were punctured across muscle fibers. Razor blade shear energy (RBE, N*mm) was calculated as the area under the force deformation curve from the beginning to the end of the test. The data was analyzed at 10mm of penetration by the blade.

Proximate analysis was performed on the raw breast at the University of Arkansas Central Analytical Laboratory. Dry matter content (DM), ash, protein, and fat, vitamin A, α-tocopherol, and δ-tocopherol were determined by AOAC approved methods (AOAC, 1990). Five samples were taken from each replication (20 samples from each treatment). However, in the case of the vitamins, only 2 samples from each replication (8 from each treatment) were analyzed.

The left breast and thighs used for sensory evaluation were blast frozen at 48h postmortem. After thawing the meat, a consumer test was conducted on the breast and thigh meat. The samples from the Slow-Out and the Fast-In treatments from Exp. 1 were chosen for consumer testing because they represented the alternative system and the conventional system. The consumer panel of 81 was screened for consumers of organic poultry products, both white and dark meat. Assorted breast fillets and thighs from each treatment were cooked on racks in aluminum-lined, covered pans to an internal temperature of 76° C and cut into bite-size cubes. Meat was not salted or seasoned. The breast fillets were cooked without skin, whereas the thighs were cooked with the skin on. The thigh skin was removed after cooking.

Consumer panelists were each served samples from the different treatments one at a time and were instructed to cleanse their palates between samples with distilled water and unsalted crackers. They were asked to evaluate their overall liking of the product, liking of appearance, liking of texture, liking of flavor. Nine-point hedonic scales were used to assess overall liking and liking of appearance, texture, and of flavor (1 = dislike extremely to 9 = like extremely). Samples were arranged in a complete randomized block.

Descriptive analysis was done on breast and thigh meat from Exp. 1 (treatments Slow-Out, Slow-In, Fast-Out, and Fast-In). After thawing the meat, fillets were baked using the same cooking parameters and procedures as described for instrumental analysis. Descriptive analysis was conducted by a seventeen -member trained meat descriptive panel. Initial orientation was held to refine particular attribute definitions. The trained panel used 7 descriptive textural attributes to evaluate tenderness characteristics of breast meat. Initial hardness, cohesiveness, moisture release were evaluated in the first bite stage, while hardness of mass, cohesiveness of mass, fibrousness, and number of chews to swallow were evaluated in the chewdown stage. Intensities of each of the texture attributes from each breast sample were compared to references of assigned intensities. All intensities were expressed to one significant digit on 15-point numerical scales.
The panel used 16 descriptive flavor techniques to describe the white meat: sweet, salty, sour, bitter, cooked white meat, white meat fat, blood serum/metallic, sweet aromatic, other, astringent, metallic, cooked white meat aftertaste, white meat fat aftertaste, blood serum/metallic aftertaste, sweet aromatic aftertaste, or other aftertaste. Similar attributes were used to describe the flavor of the dark meat. Panelists were randomly presented samples from all treatment groups in duplicate utilizing a randomized complete block design. Between each sample, panelists were instructed to cleanse their palate with water and crackers.

Statistical Analysis

Exp. 1: The data in this completely randomized (2x2) factorial design (genotype, production system) was subjected to analysis of variance using the General Linear Models procedure (SAS Institute, 1999). Genotype and production system were analyzed as main effects. Treatment means were separated using Fisher's Protected Least Significant Differences (LSD). For the descriptive sensory data, the panelist was treated as a random effect and genotype and production system as fixed effects. The consumer sensory data was analyzed as a paired t test with panelist as the blocking variable.

Exp. 2: The data in this completely randomized (2x2) factorial design (genotype, feed) was also subjected to analysis of variance using the General Linear Models procedure (SAS Institute, 1999). Genotype and feed were analyzed as main effects and treatment means were separated using LSD.

Research results and discussion:

Exp. 1: The Fast birds gained more weight (3379.32 g) than the Slow birds (2179.62 g) ($P < 0.05$), even though they were placed 4 weeks later. As expected, feed intake was higher for the outdoor birds than indoor, for both Fast and Slow. Birds tend to increase feed intake in cold temperatures or it is possible they eat more due to activity and exercise. Indoors, the Fast birds had a higher intake than the Slow birds; however, outdoors, there was no significant difference in feed intake between Fast and Slow birds. In terms of feed efficiency, there was also a significant interaction. The Slow birds had a poorer feed conversion than the Fast, both indoors and outdoors. Slow-growing birds have a poorer feed conversion than fast-growing birds, because they must eat more to achieve the same amount of weight gain. The outdoor birds had a poorer feed conversion for both Slow and Fast birds.

The Fast birds are not as hardy as the Slow birds and had a higher mortality (10% vs. 1%, respectively) ($P < 0.05$). Small farmers have reported that Slow birds have low mortality and are suited for outdoor production systems.

In terms of mean carcass yield, there was a significant interaction between genotype and production system ($P < 0.05$). The Fast birds had a higher mean carcass yield than the Slow birds, both indoors and outdoors. Outdoor access resulted in a lower yield in the case of the Slow birds but not the Fast birds. This is likely due to the fact that the Slow birds are more active than the Fast birds and the exercise outdoors results in a lower yield. The Fast birds had a higher breast yield than the Slow birds ($P < 0.05$). Fast-growing birds have been selected for high breast yield. The Slow birds had a higher wing percentage than the Fast birds, both indoors and outdoors. Access to the outdoors resulted in a lower wing yield for the Slow birds but not for the Fast birds. In terms of leg yield, there was a significant main effect for both genotype and production system ($P < 0.05$). The Slow birds had a higher leg yield than the Fast. The outdoor birds had a higher leg yield than the indoor ($P < 0.05$). These data indicate that the carcass yield and the breast yield are superior in fast-growing birds. Slow-growing birds yield a higher percentage of their body weight in dark meat than the fast-growing birds. Outdoor access resulted in a higher leg yield, probably due to the use of the leg muscles.

The color of the breast meat was examined (without skin). In terms of the b* variable, there was a significant interaction ($P < 0.05$). The meat of the Slow birds was more yellow than the Fast birds, both indoors and outdoors. Outdoor access results in more yellow meat in the case of the Slow birds; however, not in the case of the Fast birds. It is likely that the Fast birds did not forage sufficiently outside to make the skin more yellow. Plants contain pigments that can influence the color of the meat and skin. The Slow birds, on the other hand, were very active foragers.

There were no significant differences among treatments for dry matter or ash. There were genotype and production system effects for fat ($P < 0.05$). The Slow birds had only half the amount of fat than the Fast birds. The Outdoor birds had less fat than the Indoor birds. Selection for fast growth and high meat production has also been associated with higher fat. Slow-growing birds may have lower fat since they have not been selected as much for high meat production. Outdoor access may result in lower fat due to the exercise. These data indicate that Slow birds and birds raised with outdoor access have health advantages for consumers in terms of fat intake.

There were no significant differences in terms of vitamin A. In terms of vitamin E, there were genotype effect for both δ-tocopherol and α-tocopherol--the Fast birds were higher in both than the Slow birds ($P < 0.05$). Because many small farmers claim that their birds raised on pasture have higher levels of vitamins than conventional birds, it was surprising that it did not hold true in this case. Research at Pennsylvania State University has shown that eggs from birds raised on pasture have more vitamin A and E than those of conventional birds.

In terms of cook loss, there was a significant interaction ($P < 0.05$). The Fast birds had a higher cook loss than the Slow birds, both indoors and outdoors. A high cook loss can result in dry meat products.

In terms of instrumental tenderness tests, there was a significant interaction between genotype and production system ($P < 0.05$). The Slow birds were more tender than the Fast birds, both indoors and outdoors ($P < 0.05$). Outdoor access resulted more tender birds in the case of the Fast birds, but in the case of the Slow birds, the indoor birds were more tender than outdoor. It is not clear why the Slow birds were more tender than the Fast birds. According to Swatland (1999), the focus of the poultry industry has been on fast-contracting glycolytic fibers—the breast—and less attention paid to slow-contracting fibers that contain lipid droplets and mitochondria and contribute more to taste, tenderness, and juiciness. He cites Grey et al (1986) that slow-growing turkey meat may be more tender than fast. In any case, measurements from all the treatments were in the intensity range of “moderately tender” to “extremely tender.”

In terms of sensory analysis, results from the descriptive analysis by the trained panel showed no significant differences in initial hardness or moisture release in the first bite stage. However, the production system main effect was significant for the cohesiveness attribute ($P < 0.05$). The breast meat from the outdoor birds was more cohesive than the indoor. In general there were few significant differences for the flavor of the breast meat although the Fast birds tasted more salty than the Slow birds ($P < 0.05$). In terms of flavor of the thigh meat, again the Fast birds were more salty than the Slow Birds ($P < 0.05$). Also, the Slow birds had more dark meat fat flavor than the Fast birds ($P < 0.05$). Flavor is typically associated with dark meat because there is more fat in dark meat than white. The Fast birds had a more astringent flavor and a stronger cooked dark meat aftertaste than the Slow birds ($P < 0.05$).

Results from the sensory analysis by the consumer panel showed no significant differences in overall liking, appearance, texture, and flavor of the breast meat or of the thigh meat. Liking was high for all products--all of the means of the hedonic measurements reached at least 6 (like slightly) and most were higher, with the exception of the mean of the liking of appearance of the thigh meat which reached only 5.6 to 5.9.

Exp. 2:
In terms of weight gain and feed intake, there were significant interactions between genotype and feed ($P < 0.05$). The Slow birds increased in mean weight (2887.62 g) when fed the Reg diet compared to the Low diet (2593.2.62 g). However, this effect was not seen in the Fast birds; their weights did not differ significantly. The Fast birds consumed more feed when the diet was Low compared to Reg. The Slow birds did not consume more in the same case. The Fast birds may have more capacity to

eat than the Slow birds and can therefore maintain its weight even if the diet is inadequate. In terms of feed efficiency, there were genotype and feed effects ($P < 0.05$). The Fast birds had a better feed conversion than the Slow birds. The Reg birds had a better feed conversion than the Low birds.

Participation Summary

Educational & Outreach Activities

PARTICIPATION SUMMARY:

Education/outreach description:

Published Abstracts:
Fanatico, A.C., P. B. Pillai, J. L. Emmert, C. M. Owens. 2005. Impact of Alternative Broiler Genotypes and Production Systems on Meat Quality. Poultry Science (in press).

Fanatico, A. C. P. B. Pillai, C. M. Owens, J. L. Emmert. 2005. Impact of Alternative Broiler Genotypes and Production Systems on Growth Performance and Carcass Yield. Poultry Science (in press)

Manuscripts will be submitted to Poultry Science.

The study is also part of a doctoral dissertation being written by Anne Fanatico at the University of Arkansas called Natural and Organic Poultry Production: Impact of genotype, production system, and nutrition on performance, welfare, and meat quality of broilers for specialty markets.

For related research, see additional research conducted at the University of Arkansas:
Fanatico, A.C. P. B. Pillai, L. C. Cavitt, J. L. Emmert, C. M. Owens. 2005. Evaluation of slower-growing broiler genotypes grown with and without outdoor access: Meat quality. Poultry Science. (in press).
Fanatico, A.C. P. B. Pillai, L. C. Cavitt, C. M. Owens, J. L. Emmert. 2005. Evaluation of Slower-Growing Broiler Genotypes Grown With and Without Outdoor Access: Growth Performance and Carcass Yield Poultry Science. (in press).
Fanatico, A.C. P. B. Pillai, L. C. Cavitt, J.F. Meullenet, J. L. Emmert, C. M. Owens. 2004. Comparison of sensory qualities of poultry meat from alternative slow-growing breeds and a commercial breed grown with or without outdoor access. Poultry Science (in press). ABS

Project Outcomes

Project outcomes:

This study has been a touchstone project that has attracted additional interest. The alternative poultry production system research facility was successfully established at the University of Arkansas for this study. It will continue to serve in additional research efforts in the future and as a demonstration unit. There are already other projects that have been funded that will make use of this system (Emmert, J. 2004). The facility is more substantial than small farmers tend to use and has the advantage that it can be used year-round because of the insulation and ventilation.

It also has welfare advantages over field pens that are open to the elements. The UA research unit serves to demonstrate to small farmers how to protect birds from the elements while providing outdoor access with a portable unit year-round.

The innovative objectives of this study attracted the attention of welfare scientists. Data concerning behavior and welfare of slow-growing birds raised in an alternative production was taken in addition to the objectives outlined in this project and will be analyzed and reported by researchers at the University of California at Davis.

According to this study, raising birds on pasture is less efficient in terms of feed efficiency than raising them indoors, probably due to cool weather or exercise. However, many small farmers are committed to outdoor access and believe it provides other benefits. Raising slow-growing birds is less efficient than fast-growing birds in terms of feed efficiency due to their slower rate of growth. Slow-growing birds are also less efficient in terms of a lower carcass and breast yield. Small farmers need to be prepared for these additional costs. However, slow-growing birds are more hardy with a lower mortality, and being more active, are more suited to alternative production systems than fast-growing birds. The fact that slow-growing birds yield a higher percentage of their carcass weight in dark meat than fast-growing birds may indicate a need to focus on dark meat marketing for natural and organic growers using these slow-growing genotypes.

Outdoor access results in a much more yellowness in the meat in the slow-growing birds but not the fast-growing birds. This may indicate that the slow-growing birds are active foragers and consume pigment-containing plants. The fast-growing birds were not observed to forage actively. The fast-growing birds ventured outside but grouped around the outside feeder instead of foraging for plants. Yellow skin and fat can be a marketing advantage for free-range poultry products and can provide a visual indication for consumers.

Outdoor access resulted in breast meat that was lower in fat than meat from birds raised indoors. In addition, meat from slow-growing birds was lower in fat than meat from fast-growing birds. These are health advantages for consumers. Surprisingly, meat from the birds with outdoor access did not have more vitamins than indoor birds.

Tenderness is not a problem in meat from chickens raised in outdoor systems; nor is it a problem in meat from slow-growing genotypes.

Although the trained panel indicated that the breast meat from outdoor birds was more cohesive than indoor, the consumer panel did not indicate any differences in liking of texture. Likewise, the trained panel indicated that the thigh meat from slow-growing birds had a stronger dark meat fat flavor; however, the consumer panel did not indicate a difference in liking of flavor among treatments.

These data indicate differences among genotypes and provide information about the efficiency for alternative poultry systems.

Economic Analysis

This study did not include an economic analysis. Additional projects have been funded that will examine the use of slow-growing birds in organic production and will include an economic analysis (Emmert, J. 2004). However, in terms of efficiency, it will cost more to produce slow-growing birds. A premium needs to be charged for the birds to realize profits.

Farmer Adoption

Small farmers continue to use “pastured poultry’ production systems in which the birds have outdoor access. The PasturePoultry listserver has over 1,500 members. Small farmers mainly use fast-growing Cornish Cross; however, they are increasingly interested in slower-growing strains. S & G Poultry, which supplies fast-, medium-, and slow-growing birds reports an increase in sales of medium- and slow-growing birds in the past several years (Eiland, 2005).

Small farmers continue to be interested in heritage breeds, while the poultry industry has focused completely on Cornish x White Rock. Heritage breeds such as New Hampshire and Wyndottes have not been selected for commercial production since the 1950s. Current stocks would take exceptionally long to reach market weights.

Larger companies continue to increase number of birds grown naturally or with outdoor access. Companies providing organic poultry meat include Eberly Poultry Farms, Raised Right, Petaluma, Townsend, and Organic Valley. Very few large companies use specialty breeds.

Slow-growing broilers represent an opportunity for small farmers to have hardy, active birds that make good use of forage in alternative systems to produce a product with more dark meat flavor and less fat in the breast meat. Small farmers also have the ability to rotate small houses to fresh pasture and can help maintain consumer confidence in products that are pasture-based.

Recommendations:

Areas needing additional study

Studies are needed with additional genotypes, and a project is needed to encourage breeding of heritage breeds, especially breeds with regional ties in the U.S.

More studies are needed on the nutritional content of pasture-based poultry systems, especially for vitamins. Pasture rotation may be needed for vitamins to increase in poultry products.

It is important to conduct additional research on alternative poultry production systems, especially systems with pasture rotation or portable housing. It is a challenge to maintain portability of research units because they are difficult to automate and the yards must be subdivided adequately to obtain the number of replications needed for statistical validity. Therefore, most free-range poultry research is done in stationary facilities. However, poultry may overuse and damage pasture in stationary facilities, eventually resulting in dirt yards.

It is important to look at the welfare of poultry raised in alternative production systems. Although free-range systems are meant to improve welfare, attention must be paid to ensure birds are protected from the elements. Substantial housing, such as used in this study, is needed.

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