Improving Growth and Yield of Commercial Pheasants Through Diet Alteration and Feeding Program

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Introduction

Preliminary data from our laboratory allowed for the establishment of an understanding of the basic growth of pheasants. It was clear from this work that the commercial pheasant, like other poultry species (Anthony et. al., 1996, 1991a, b), follows a standard sigmoid growth curve which reaches asymptotic weights shortly after 16 weeks. In fact, the pattern of growth observed for the current commercial pheasant is reminiscent of the commercial broiler of the 1950's (Anthony et. al. 1998). Unfortunately, the commercial pheasant of today is being reared on flight diets designed for hunt birds. In this scenario there is little interest on maximizing growth and yield. Of course, this philosophy is not consistent with maximizing growth in weight selected pheasants.

The impact of feeding substandard diets on growth, feed conversion and yield is dramatic. In fact, Havenstein and coworkers (2003a, b) revealed that as much as a 20% increase in growth can be realized for birds reared on modern diets. In addition, this improvement of growth was observed for not only fast but also slow growing strains. Feed conversion was also negatively impacted by feeding a substandard diet. Breast yields were also impacted as birds fed the improved diet had heavier breasts than the birds fed the diet of the 1950's. In addition, this observation was consistent for modern broilers (20+ percent increase) and a slow growth strain (10 percent increase). Scientist's careers have been made studying the nuances surrounding the development of broiler and turkey diets designed to maximize growth and yield. Very little work has been reported for pheasant.

It is unclear if reduced growth rates associated with feeding diets that are limiting in protein and energy will result in conditions that impact product quality. Mitchell and Sandercock (1994) have shown that skeletal muscle in modern rapidly-growing broiler strains has an increased susceptibility to stress-induced damage, and this may account for at least some of the meat quality problems now being encountered. Factors including genetic selection, better feed efficiency and better management have contributed to the increased growth rate of modern poultry. Over the past 20-30 years body weights of broilers and turkeys have nearly doubled. Faster growing, or heavier birds have been shown to be more susceptible to heat stress indicated by great metabolic heat production, increased body temperatures, and mortality (Hunt et al. 1999, Mills et al., 1999). Furthermore, in a review by Mahon (1999), the author concluded that commercial lines of turkeys selected for enhanced growth exhibit a greater incidence of muscle abnormalities than non-selected turkey lines.

It is expected that the market for yield-type pheasants will continue to develop. Thus there is a need for an improved understanding of production environments designed to maximize the efficiency of growth and genetic selection. As previously mentioned, the commercial diet is one of the most important environments a bird will be exposed to during its life. Although the literature contains inconsistencies as to the quality of selection environment and resultant selection response there is a general feeling that selection should occur under conditions consistent with those that the progeny will be reared in (Falconer, 1990). In addition, selection in a good environment will result in more rapid selection response (Falconer and Latyszewski, 1952). One thing that is clear is that if the progeny of the selected population is to be exposed to a variety of environments then selection in a deficient environment is desired. This stresses the importance of developing a consistent non-deficient diet. It is important to the production and selection program of the commercial pheasant. Therefore, the purpose of this project was two-fold. First to determine if growth and yield of the commercial white pheasant can be improved by providing a diet sequence that more closely resembles that designed to maximize growth in turkeys and broilers. Secondly, to identify the proper feeding program to maximize growth and yield of the commercial white pheasant.

Materials and Methods

At hatch, 1500 pheasant chicks were sexed and shipped to the University of Arkansas Poultry Research Farm for placement. The chicks were individually banded and randomly assigned to treatment pens (5.5' x 12'). Each pen was fitted with a Plasson waterer and 2 tube feeders and housed a minimum of 50 straight run chicks. Two series of diets were provided. The first series was the traditional starter, grower and marketer diets designed for the release/ hunt bird market. The second series of diets were formulated to be high density and more similar to a commercial diet fed to broilers. In addition to the comparison of the control verses high density diets was the study of duration of feeding (3 verses 5 week increments) the respective diet on growth. A summary of the specific treatments applied in this study are summarized in Table 1. This strategy created the opportunity for a 2 by 2 randomized complete block design and was analyzed as such. There were 4 replicates of each diet by feeding program combination. Since there were 28 pens available for this study, we were able to explore 3 additional variations of feeding program in an incomplete block design. There were 4 replicates of each variation on feeding program.

All birds were provided feed and water *ad-libitum*. Daily mortality was recorded and body weight and feed intake measured weekly. Data collected from 4 replicate pens per treatment included body weight and feed conversion at 0, 3, 5, 8, 10, 12 and 15 weeks of age. Pheasants were processed at 12 and 15 weeks of age. At 12 weeks, 20 birds (10 males and 10 females) per pen were randomly selected for processing. The remaining birds were processed at 15 weeks of age.

Ten hours prior to processing feed was withdrawn but birds had continued free access to water during this period. Birds were transported in coops to the processing plant 1 hour prior to slaughter. Upon arrival to the plant, birds were weighed, subjectively scored for feather coverage and hung on a shackle line and processed using in-line commercial equipment. Birds were electrically stunned (11 V, 11 mA, 10 s), manually cut (severed left carotid artery and jugular vein), bled (1.5 min), scalded (55^{0}C, 2 min) and picked with the use of in-line commercial defeathering equipment. Birds were eviscerated and placed in a pre-chill tank for 15 min (12^{0}C) and a chill tank for 45 min (1^{0}C). Carcasses were stored on ice at 4^{0}C in a cooler until further analysis. Carcass downgrades were recorded. Traits of economic importance including *Pectoralis* major and minor, leg, thigh and wing yields were recorded. These data were used to evaluate the impact of respective feeding program on growth and productivity.

Results and Discussion

Because of the increasing acceptance and demand for pheasant products in the national and international markets there has been a substantial shift from processing release birds to that of weight selected high yielding pheasants. This shift has created new challenges for growers who are trying to maximize facility efficiencies and growth potential while not jeopardizing bird fitness. A study was conducted to characterize the growth and development of the commercial pheasants reared on control or high density diets from hatch to 15 weeks of age. In addition, the duration of the starter, developer and marketer diet phases was explored. Data collected from 4 replicate pens per treatment included body weight and feed conversion at 0, 3, 5, 8, 10, 12 and 15 weeks of age. A 20 bird subset (10 per sex) from each pen was processed at 12 and 15 weeks of age to determine the effect of diet on yield.

Because of the magnitude of the study supported by this grant only a small portion of the data can be presented in an abbreviated final report such as this. In general, pheasants reared on starter diets, control or high density, to 5 weeks post hatch had higher weights from 5 to 10 weeks than birds shifted from starter to developer at 3 weeks of age (Figure 1). It appeared that feeding the control starter diet to 3 weeks was enough to inhibit growth through to the processing age of 15 weeks. In fact, there was a slight difference in body weight between birds fed the control starter diet to 3 weeks and birds fed starter to 5 weeks of age (Figure 1 and Table 2). Other than this difference, 15 week body weights did not differ between high density and control type diets regardless of feeding program. Despite only minor differences in final weights between feeding treatments there were substantial differences in feed conversion, breast yield and breast conversion ratio (kilograms of feed necessary to produce kilograms of breast meat).

An example of the importance of the timing of feed change and feed density can be found in Table 2. Based on our results, Treatment C produced the most efficient production of pheasant. This was apparent by this treatment having the lowest feed conversion ratio, an intermediate breast yield and the lowest feed to breast conversion ratio. With regard to cumulative FCR, Treatment C verses D provides an example of extremes but they only differ in the duration of feeding starter, developer and marketer high density diets (Tables 1 and 2). This difference in feeding schedule resulted in at least 40 points of feed conversion which is huge by industry standards. A second comparison worthy of discussion in this research summary is that of Treatment C and E. These treatment combinations are essentially identical except for the fact that Treatment C was fed a high density starter for the first 3 weeks post hatch while Treatment E received control starter for the 3 week starter period. Clearly this subtle difference in starter diet, although of the same duration, had dramatic effects. Not only did this change damage 15 week body weight (Table 2) but also resulted in a greater than 70 point difference in cumulative feed conversion, and, despite equal breast weights, had a feed to breast conversion ratio that differed by greater than 230 points in favor of Treatment C. If one considers feed prices at $300 per ton one could calculate a savings of approximately $0.75 per kilogram of breast produced by Treatment C verses E. When one considers that the average Treatment C bird produces .314 kilograms of breast that is a savings in feed alone of approximately $0.24 per bird or $24,000 for every 100,000 birds processed.

As previously mentioned, the developing pheasant meat industry has required the shift from hunt pheasants to yield type pheasants; a trend consistent with the movement from dual purpose chickens to specific meat and egg lines. This has led to the development of selection programs mimicking that of the broiler and turkey industries. Identification of the age at which the pheasant is the most efficient in producing salable meat is important in designing selection programs to maximize and monitor response. The identification of a stable diet series for rearing commercial pheasants has allowed for production uniformity necessary for forecasting and meeting production goals. The final marriage of nutrition and genetics is important to realize the true genetic potential of the commercial pheasant. Data collected in the current study are consistent with the findings of Havenstein and coworkers (2003a, b) where at points on the growth curve one can observe substantial body weight and yield advantage for birds fed a high density diet over the traditional hunt diet.

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Table 1. Treatment designations for pheasant growth trial.

Treatment	Weeks	Diet[1]	Weeks	Diet[2]	Weeks	Diet[3]
A	0 to 3	CS	3 to 8	CD	8 to 15	CM
B	0 to 5	CS	5 to 10	CD	10 to 15	CM
C	0 to 3	HDS	3 to 8	HDD	8 to 15	HDM
D	0 to 5	HDS	5 to 10	HDD	10 to 15	HDM
E	0 to 3	CS	3 to 8	HDD	8 to 15	HDM
F	0 to 5	CS	5 to 10	HDD	10 to 15	HDM
G	0 to 5	CS	5 to 10	CD	10 to 15	HDM

[1]CS = control starter; HDS = high density starter
[2]CD= control developer; HDD = high density developer
[3]CM= control marketer; HDM = high density marketer

Table 2. Summary of growth response for birds reared on high verses low density diets for varied amounts of time[1]

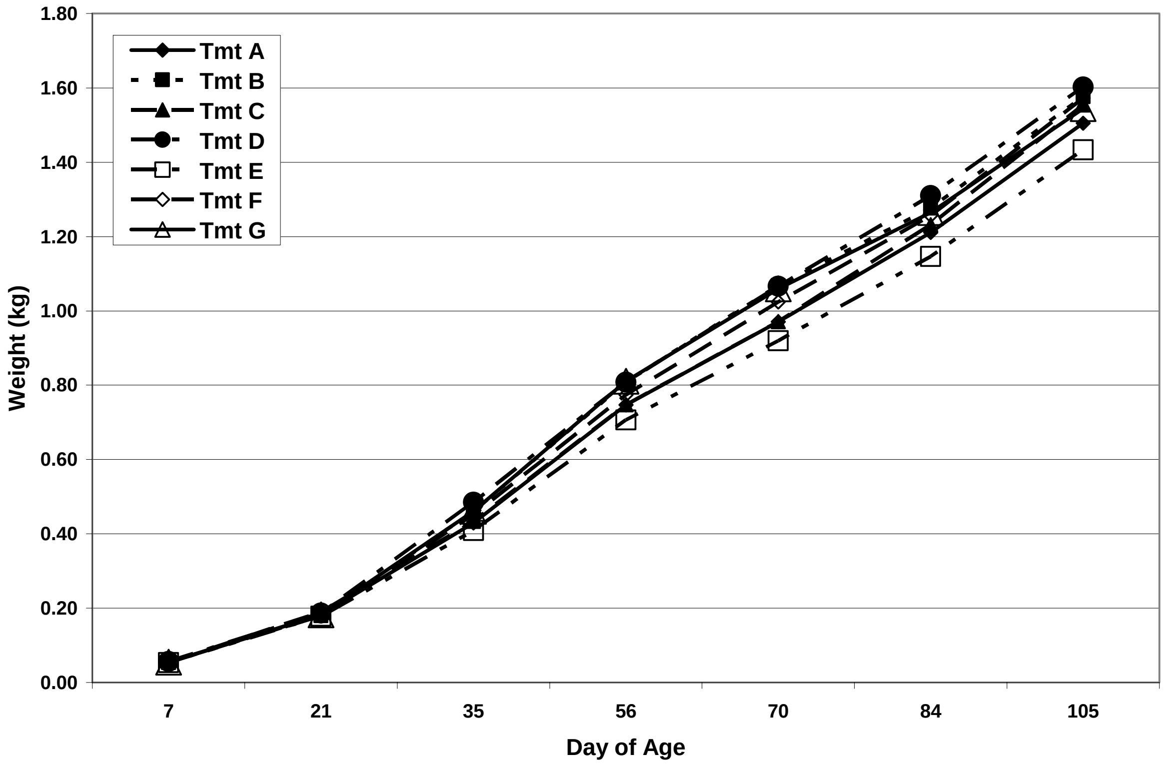
Treatment	BW 15 Wks	Cumulative FCR	Breast Wt (kg)	Breast FCR
A	1.505^{ab}	3.290^{bc}	0.317^{abc}	15.043^{abc}
B	1.553^{ab}	3.196^{bc}	0.327^{abc}	14.693^{abc}
C	1.554^{ab}	2.973^{c}	0.314^{bc}	14.170^{c}
D	1.602^{a}	3.373^{ab}	0.337^{a}	15.548^{abc}
E	1.433^{b}	3.705^{a}	0.311^{c}	16.464^{a}
F	1.573^{a}	3.536^{ab}	0.331^{ab}	16.199^{ab}
G	1.544^{ab}	3.230^{bc}	0.334^{ab}	14.415^{bc}
Pvalue	0.08	0.01	0.03	0.05

[1]See Table 1 for specific treatment designations

Treatment means within a column with different letters (a, b, c) are significantly different as indicated by pvalue.

FCR=kilograms feed/kilograms body weight; Breast FCR= kilograms feed/ kilograms breast meat

Figure 1. Cumulative growth curves for birds fed control and high density diets for varied amounts of time[1]



[1]See Table 1 for diet treatment designation.