

## Review Article

# The impact of manipulation phase feeding system on the broiler performance and carcass lipid profile: A review

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## Abstract

This article intended to include the effect of manipulation phase feeding systems on broiler performance and carcass-serum lipids. The results of many different research studies were conducted to evaluate the effect of different phase feeding. The result showed that broiler performance was not affected but fat deposition and cholesterol, total feed intake was significantly reduced by the different phase feeding programs. So, we can conclude that phase feeding is one of the methods to reduce fat deposition and cost by controlling the amount of feed intake.

## Introduction

In today's poultry industry, practices in both levels of management and commercial feeding programs faced many problems such as high-fat deposition, and feed loss besides that early nutrition is so important final body weight is strongly related to early age feeding. These problems can be covered by a phase feeding system which is defined as a system designed to meet the needs of the diversified poultry production system. Phase feeding or feeding time period according to the National Research Centre [1] is known as the number of nutrients requirement of broiler chickens that depends on the fact that amino acids or protein requirements decrease with age so it provides a single set of recommendations that includes both male and female, advocates a three fixed phase feeding program (starter, grower and finisher diets) in period 0 - 3, 3 -6 and 6 -8wk of age respectively named as a traditional feeding system, which is useful as a reference, these recommendations may be difficult for nutritionists to apply to commercial nutrition programs. Nowadays finding the most economic means in the poultry industry is very important and any improvement in production practices may lead to substantial profit when multiplied by the large volume

of poultry production. Phase feeding may lead to limiting excess dietary amino acids. National Research Centre on the weekly diminishing (3phases) but early researchers [2-9] suggested that this diminishing occurs daily so they adopted a multiphase feeding which resulted on reducing amino acid uses through reduction nitrogen exertion, fat accumulation on the carcass, production cost (increasing efficiency and decreasing amino acid supplementation), and improving feed efficiency utilization. Also, Bizerary, et al. (2002) stated that multiphase feeding reduced the incidence of some metabolic disorders. Roush, et al. [4], proved that multiphase feeding is a benefit to the environment through reducing nitrogen exertion. Whilst Poop and Emmert [10] stated that multiphase feeding is a beneficial feeding program, especially for broilers rare in hot climatic (tropics).

## Effect of phase feeding on broiler performance

Dozier, et al. [11], stated that broilers fed provision of a high amino acid density diet increased body weight gain and decreased feed conversion ratio but feed consumption and the incidence of mortality were unaffected; also, he reported that diets formulated to a high nutrient density in the 3-phase schedule increased body weight and body weight gain [11]. De



Basilio, et al. (2002) stated that sequential feeding recently proved to be effective in reducing mortality under acute heat challenges during the finishing period. Pope and Emmert [12] stated that there were no differences in growth performance between birds fed Phase Feeding- or National Requirement Centre-based diets. Warren and Emmert [5] reported that phase feeding program affected body weight, and nutrient substrate intake with similar carcass energy per kg of diet was observed for all feeding programs in both trials, But feeding the three-phase feeding program resulted in reduced percent protein intake with greater final body weight than the grower diet feeding program; He concluded that feeding a grower diet throughout is not a practical method of growth restriction for broilers and that current phase feeding still is merited for broilers. Gutierrez, et al. [13], found that during early age, birds on both continuous multiphase feeding programs had significantly greater cumulative body weight gain and improved feed conversion ratio compared to the 4-phase feeding program. Pope and Emmert [12], found that performance was unaffected whilst, feed efficiency was reduced under normal temperatures. Tolimir, et al. [14], concluded that multiphase feeding had an effect on performance especially the level of food utilization. Warren and Emmert [5], found that phase feeding not affected weight gain and feed intake among treatments. Concluded that phase feeding reduced dietary costs without sacrificing growth performance or carcass yield. Nasril [15] indicated that intensive multi-phase feeding improved body weight gain and feed-to-gain ratio only at an early age with no effect on overall performance. Roush, et al. [4], in an experiment designed to determine the period of starter, grower, and finisher phase feeding and found no significant differences in final body weight, and feed conversion ratio. Pope, et al. [16], found no effect on body weight gain, feed intake, or feed conversion ratio. Hooshmand [17] in a study to compare four feeding programs on broiler parameters found no significant differences in final body weight, feed intake, feed conversion ratio, also no interaction effect on body weight, feed intake, and feed conversion ratio. Saleh, et al. [18] stated that increasing the duration of feeding a starter diet significantly affected mortality. Waldroup, et al. [19], observed that when the starter diet reached 29 days; no significant effects on feed intake. Zhao, et al. [20], concluded that there were increases in feed conversion ratio, protein efficiency ratio, and energy efficiency ratio, respectively.

### Effect of phase feeding on carcass traits

The feeding schedule did not influence carcass weight or its relative yield as measured at processing [11]. Warren and Emmert [5] reported that phase-feeding diets resulted in decreased digestible lysine and threonine intake thus no differences in breast meat, wings, or legs yield. Pope and Emmert [12] stated that there were no differences in carcass yield between birds fed Phase Feeding- or National Requirement Centre-based diets. Warren and Emmert [5] stated phase feeding program decreased the carcass protein, but feeding the starter diet throughout increased carcass protein. Breast meat, wing, and leg yield. Roush, et al. [4], in an experiment designed to determine the period of starter, grower, and

finisher phase feeding and found no significant differences in hot carcass weight, dressing percentage, and breast muscle. Pope, et al. [2], found no effect on hot carcass weight, breast, wing, or leg. Pope, et al. [10], found that no differences in the percentage of breast, wing, and leg were observed among all finisher periods. Hooshmand [17] in a study to compare four feeding programs on broilers parameter found no significant differences in organ weight. Saleh, et al. [18], stated that increasing the duration of feeding a starter diet significantly affected dressing percentage, and breast meat, while wings were not significantly affected. Waldroup, et al. [19], observed that the carcass dressing percentage of males was reduced significantly when the starter diet reached 29 days; no significant effects on carcass traits. Kamran, et al. [21], stated that carcass, breast meat, thigh yield, and relative liver and heart weights were not affected by the treatments. Piotrska, et al. [22], reported that phase feeding increased serum total protein and albumins levels. Holsheimer [23], reported that the starter diet had only a slight effect on the carcass composition of male broilers. Grower diet had a pronounced effect on the carcass composition and decreased the dietary lysine content and carcass protein content. Zhao, et al. [20], concluded that there was a decrease in carcass chemical composition. Corzo, et al. [24], observed that the final feeding phase increases thigh and wing weights; Quadratic responses on some carcass traits; carcass weights, total boneless-skinless breast meat, and drumsticks. Brewer, et al. [25]. Results of the study suggest phase feeding does not affect carcass yield or meat quality. Kerr, et al. [26], found that phase feeding reduced heart and liver weights. Wyllie, et al. [27]. Water and protein contents increased and fat content decreased with increasing protein levels. Nawaz, et al. [28], investigated the effect of different levels of energy and protein on live performance and carcass responses of broiler chicks and reported that non-significant differences in dietary treatments were observed on all of the carcass traits (Carcass, gizzard, heart, and liver weight, and Shank weight). Kamran, et al. [29], concluded that eviscerated carcass yield was significantly higher for the group fed on a diet with 20% crude protein. Breast meat yield and composition of breast meat (crude protein, and ether extract) are unchanged. Corzo, et al. [30], reported that carcass yield and breast meat protein content were unaffected by dietary treatments. Breast meat yield was maximized, but thigh protein increased in birds fed the low diets. Shanin and Abd ELazeem [31] reported that the proportion of total carcass muscle and total bone and their percentage in breast, drumstick, wing, and bone weight were not significantly affected by diet. Pope and Emmert [32] stated that no differences in carcass, breast, wing, or leg yield.

### Effect of phase feeding on fat deposition

The subcutaneous fat fatty acid compositions depend on the type of feed used during the finishing period [33]. Warren and Emmert [5] stated that feeding the grower diet throughout the grow-out period increased the carcass fat, and feeding the starter diet decreased the carcass fat deposit. Roush, et al. [4], in an experiment designed to determine the period of starter, grower, and finisher phase feeding and found no significant differences on abdominal fat pad. Saleh, et al. [18], stated that



increasing the duration of feeding starter diet significantly affected leg quarters abdominal fat content while wings were not significantly affected. Kamran, et al. [21], stated that carcass abdominal fat was not affected by the treatments. Piotrowska, et al. [22], reported that phase feeding significantly decreased triglyceride content and total cholesterol. Peebles, et al. [34], studying the inclusion of lard in starter diets concluded that serum triglycerides with very low-density lipoprotein cholesterol concentrations progressively increases. Komprda, et al. [35], found that cholesterol content increased in the sequence chicken and turkey breast meat or turkey and chicken thigh meat whereas, cholesterol content in chicken thigh meat decreased with increasing live weight. Holsheimer [23] reported that the grower diet had a pronounced effect on decreasing fat content. Corzo, et al. [24], observed that the final feeding phase provoked no responses on abdominal fat weight. Kamran, et al. [20], concluded that abdominal fat was significantly higher for the group fed on a diet with 20% crude protein. Corzo, et al. [24], reported that fat content was unaffected by dietary treatments, whereas abdominal fat percentage was increased in birds fed the low diets. Aghaei, et al. (2012) claimed that diet supplementation with FO elevated the blood levels of palmitic acid and omega-3 polyunsaturated fatty acids, and caused a decline in the level of arachidonic acid. Pope and Emmert [32] stated that abdominal fat was increased significantly.

### Effect of phase feeding on production cost

Emmert and Baker [36] used National Research Centre [1] and reported that Phase Feeding may support the elimination of some excess dietary crude protein and supplemental amino acids, thereby potentially reducing dietary costs and nitrogen excretion. Pope and Emmert [10] stated that in comparison phase feeding reduces production costs. Warren and Emmert [5] reported that the phase feeding program affected feed costs, and income was similarly affected (fewer feed costs). Concluded that phase feeding reduced dietary costs without sacrificing growth performance or carcass yield.

## Results

Phase feeding with different programs practices revealed no effect on final body weight, weight gain, carcass traits, and fatty acid concentration but it decreased abdominal fat pad weight, cholesterol, feed conversion ratio, feed intake, and feed losses sequentially production cost.

## Conclusion

Phase-feeding systems are an important nutritional factor in reducing fat deposition without depressing broiler performance. Through phase feeding, we can economically produce lean meat with economically less production cost.

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