

THE EFFECTS OF FEED FORM ON BROILER CHICKEN GROWTH PERFORMANCE

ABSTRACT

Feed costs represent a substantial portion of farmers' expenses and are a pivotal factor shaping the economics of livestock production. The physical form of diet is one of the main drivers for better digestibility of feed and improved growth performance of farm animals. This study investigated the effect of feed particle size and feed form (ground feed mixtures and pelleted feed mixtures) on the growth performance of broiler chickens. Two hundred and forty ROSS 308 FF one-day-old broilers were randomly allocated into two treatment groups, each group comprising 120 broilers or 8 iterations with 15 broilers. The experiment spanned five weeks. Both pelleted and ground feed forms were identical in ingredient and chemical composition. Initially, the broilers in the test group exhibited lower average live body weight and daily gain

compared to those in the control group. However, by the end of the trial, the broilers fed with pelleted feed mixtures displayed higher average live body weight and improved daily gain. Analysis of variance (ANOVA) revealed statistically significant differences ($p < 0.001$) between the test and control groups during the 2nd and 3rd weeks of the trial, with significance persisting at $p < 0.01$ by the trial's end. These findings suggest that utilizing pelleted feeds in the intensive fattening of broiler chickens can enhance growth performance, increase average daily gain, and shorten the fattening period.

Keywords: broiler chickens, pelleted feed, growth performance

INTRODUCTION

The productivity of broiler chickens can be increased by improving nutrition through the supplementation of concentrates or compound feed. Complete pelleted feed is a good option in this regard to ensure balanced nutrition for the broilers in the intensive rearing system since pellet feeding gives nutrition to broilers in a balanced form. Moreover, low-quality feed supply has hindered broilers' capacity to achieve their productivity potential. The ration's characteristics, such as ingredients, shape, smell, taste, and particle size, could affect the palatability and animals' feed intake. In addition, the physical form of rations is extremely important for efficiency and can affect rumen fermentation. Compared with ground feed, pelleted feed has been regarded as an efficient form for improving intake, digestibility, feed conversion, and reducing animal ingredient selection. Thus, better digestion and usability of nutrients enhance animal growth and lead to better conversion into animal products. Pelletized feed is defined as "agglomerated feedstuff" formed by grinding and extruding individual feed or mixtures, by compaction and passing through sieve openings in a mechanical process. Mechanical pressure can partly break down complicated fibre structures

and promote starch gelatinization resulting in increases in feed voluntary intake and nutritional digestibility. These pellet products are easier to handle, tastier, and more digestible and usually result in improved feeding results when compared to non-pelleted animal feed. Long-term conditioning of pellets (850C, for 3 minutes) has a positive effect on their physical quality, reducing power fraction, and improving the hygienic quality of pelleted feeds.

Due to the limited natural resources in North Macedonia, and to achieve the benefit of the produced compound feed, the present experiment was designed to develop a total mixed ration based on complete pelleted feed and evaluate its utilization for commercial broiler fattening under intensive conditions. It was hypothesized that feeding the broilers with complete pelleted feed (pelleted Total Mixed Ratio - PTMR) can enhance growth performance by improving the daily feed intake, average daily gain and feed conversion ratio compared to feeding broilers with ground fodder mixtures (un-pelleted Total Mixed Ratio - UPTMR).

MATERIAL AND METHODS

After the total mixing of ingredients, the preparation of the pelleted feed was done in the pelleting machine. The two dietary treatments were PTMR and UPTMR. Both diets had the same chemical and ingredient composition. The approximate diameter of the complete pellet was 2 mm.

The feed chemical analysis was done at the Faculty of Agricultural Sciences and Food, Ss. Cyril and Methodius University in Skopje, Republic of North Macedonia. Before the chemical analysis, pellet and other feed samples of the experimental diets were dried and ground in a grinding mill through 2-mm sieve. The crude protein (CP) content of the experimental diet was determined using the Kjeldahl method (MKC EN ISO 5983-1:2010 corrigendum). The moisture content of the feed was determined by drying the samples at 105°C overnight (MKC ISO 6496:2012), while ash was measured by burning further at 500°C for 4 hours (MKC ISO 5984:2012). Solvent extraction methods were used for crude fat analysis (MKC ISO 6492:2012). Crude fibre determination in animal feed was done according to the standard MKC EN ISO 6865:2010. Two hundred and forty ROSS 308 FF one-day-old broilers were randomly allocated into two treatment

groups, each group comprising 120 broilers or 8 iterations with 15 broilers. Experimental diets were formulated to meet the broilers' nutrient requirements for growing and fattening broilers (Feeding Standard for broilers in growing and fattening according to the Rule book for feed quality in the Republic of North Macedonia, Official Gazette 54/2014). Diets were offered ad libitum. All the animals had free access to fresh tap water. During the whole experimental period, all broilers were pen-weighted at 0, 7, 14, 21 and 28 days and feed consumption was determined for each of these periods. Average daily gain (ADG) was calculated for days 0-7 (week 1); 7-14 (week 2); 14-21 (week 3); 21-28 (week 4); 28-35 (week 5) by dividing the difference of measured weights by the period interval. The consumed feed by groups was calculated to determine the average daily feed intake ADFI. The feed conversion ratio (FCR) was calculated by dividing ADFI by ADG.

Using one-way analysis of variance (ANOVA), the statistically significant differences were tested in the growth performance of broilers in test and control groups, depending on the physical form of diet.

RESULTS AND DISCUSSION

Table 1. Ingredient composition of experimental mixtures

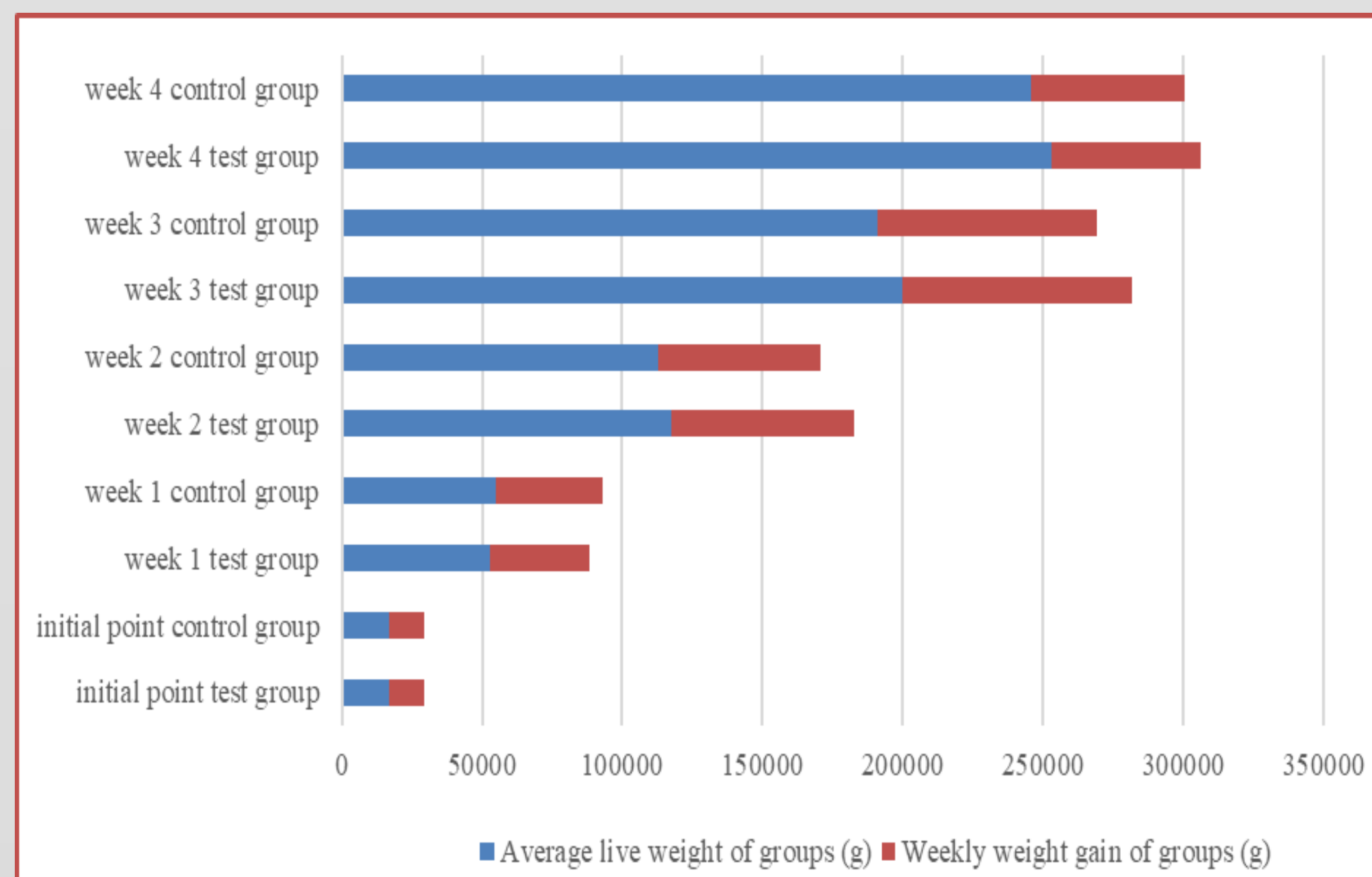
Diet Ingredients (% or gr/100gr)	Diet for fattening broilers aged 0-21 days	Diet for fattening broilers aged 21-35 days
Maize	62,5	72,5
Barley	-	-
Soybean meal	35,5	25,5
Alfalfa hay	-	-
Vitamin-mineral premix	2,00	2,00
Total (%)	100,00	100,00
Metabolizable energy, OU/kg DM		
Crude protein	1,41	1,47

Table 2. Chemical composition of experimental mixtures

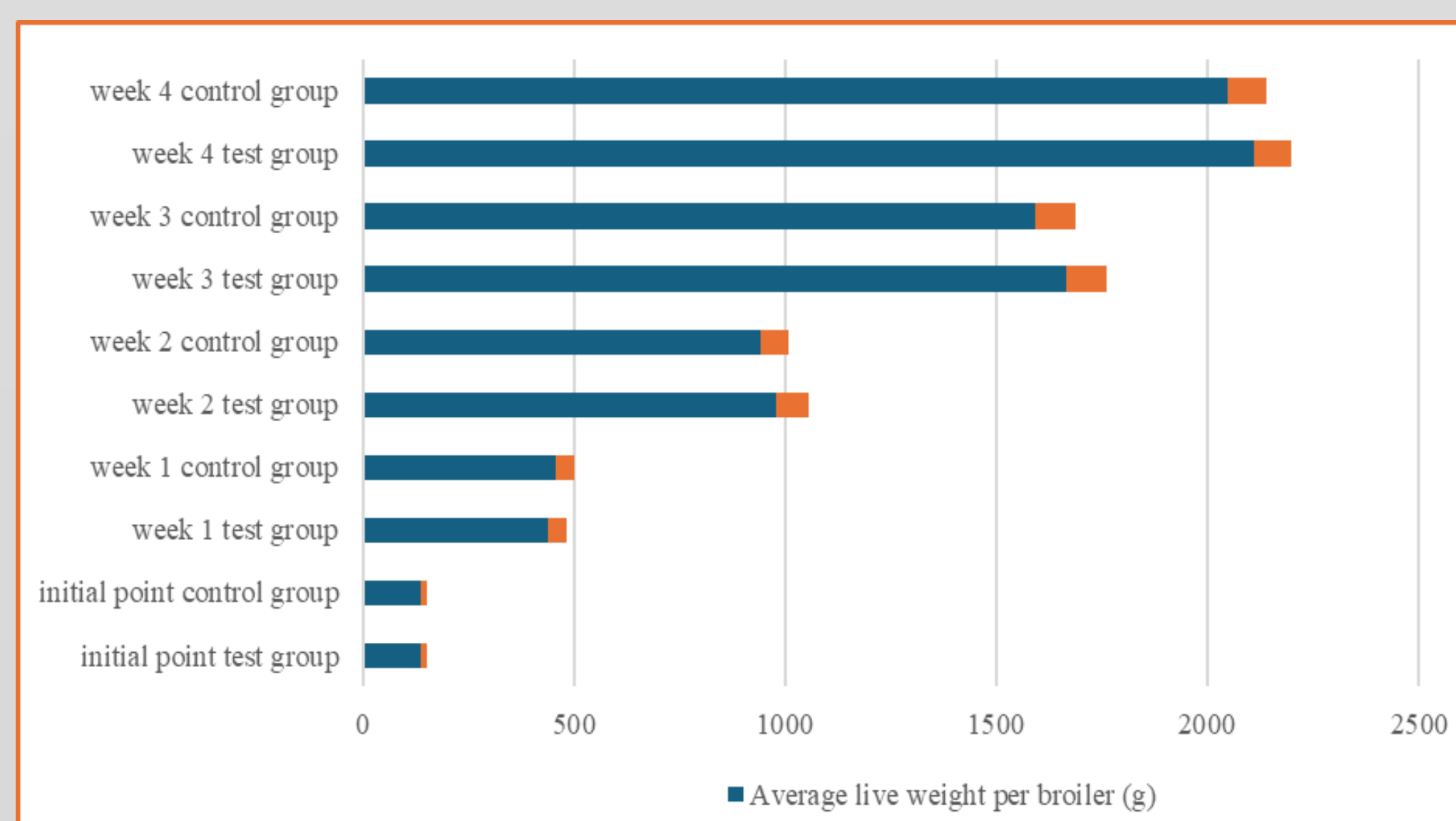
Feed	Chemical composition of the feeding mixture				
	Moisture, %	Ash, %	Crude proteins, %	Crude fat, %	Crude fiber, %
Un-pelleted ground feed	11,34	5,53	17,73	2,81	3,11
Pelleted feed	11,22	5,49	17,89	2,89	3,01

Table 3. Effects of feeding treatment on growth performance of fattening broilers

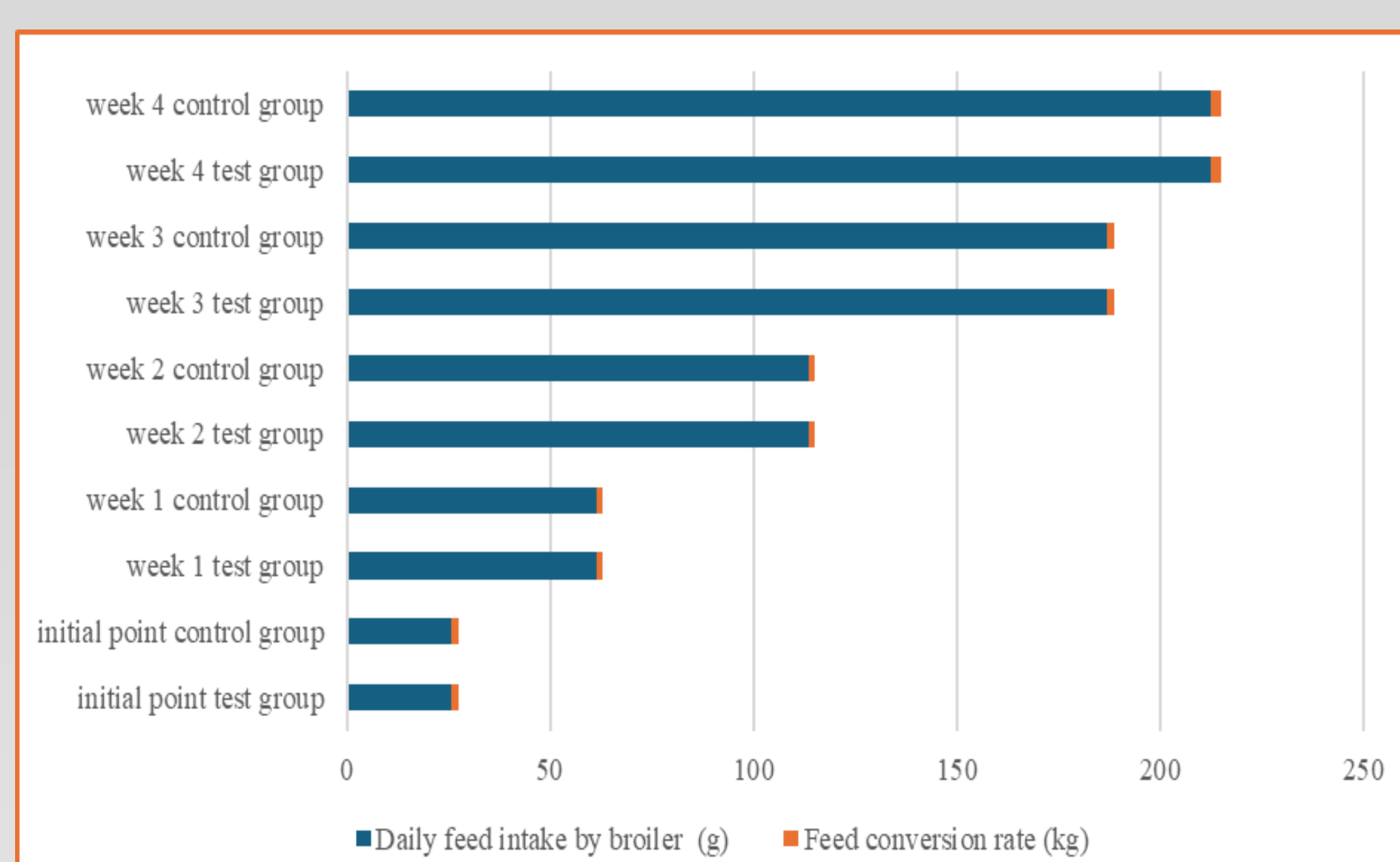
Dependent variable: Groups of broilers related to the type of diet			
Source of variation	df between groups	df in groups	F-value
Initial control	1	238	0,000 ^{NS}
Control week 1	1	238	2,757 ^{NS}
Control week 2	1	238	77,680 ^{***}
Control week 3	1	238	297,973 ^{***}
Control week 4	1	238	8,809 ^{**}



Graph 1. Growth performance of broiler groups



Graph 2. Average growth performance per broiler



Graph 3. Feed intake and feed conversion rate in groups of broilers



Picture 1. Poultry farm where trial for broiler fattening was conducted



Picture 2. Confine pen for control group



Picture 3. Confine pen for test group

CONCLUSION

The results of this study demonstrated that feeding fattening broilers PTMR enhanced their growth performance in terms of ADG and better FCR. In the intensive feedlot rearing system, providing stable and high-quality rations is necessary for improving animal growth performance and producing high-quality animal

products. The use of ground feed mixtures in animal nutrition is associated with certain weaknesses that reduce the profitability of livestock breeders. The production of pelleted feed mixtures increases the competitiveness of both the feed producer and the animal breeder.