

# Effects of dietary carrot pomace on the growth performance, feed intake and feed conversion ratio in broiler chickens

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## Introduction

The poultry meat industry is a major component in meeting the nutritional requirements of a growing world population, with an estimated global production of over 123.6 million tons in 2022 (FAOSTAT, 2024). This high demand for poultry meat requires a large demand for feed ingredients to produce the diets to feed the birds. Typically, corn and soybean meal are the major feed ingredients utilized in poultry diets. However, increasing costs and competition (Donohue and Cunningham, 2009) have prompted the poultry industry to identify and evaluate alternative feed ingredients that meet the energy and nutritional requirements of poultry.

Carrot processors produce approximately 175,000 tons of waste annually in the United States of America. The state of California is responsible for over 85% of carrot production (Bao and Chang, 1944), with an estimated 30-50% of carrot pomace produced as a byproduct after commercial juicing (Singh et al., 2006). This significant volume of pomace presents an opportunity for valuable recycling and reducing food waste, addressing environmental concerns by repurposing material that might otherwise end up in landfills. Carrot pomace is rich in bioactive compounds, such as carotenoids. Studies on mealworm larvae growth in carrot pomace substrates revealed across all moisture sources, days to pupation was lowest around 50% carrot pomace in the substrate but increased drastically as the percentage increased to 100% carrot pomace (Rovai et al. 2021). Although carrot pomace is high in fiber and low in protein, it may be useful as a poultry feed ingredient at low dietary inclusion rates (less than 10%).

## Purpose and Objectives

The objective of this study was to determine the effects of dietary carrot pomace on growth performance, feed intake and feed conversion ratio of broiler chickens.

## Methods

**Ethics approval.** All experimental procedures used in this study were reviewed and approved by the California Polytechnic State University Institutional Animal Care and Use Committee (Protocol #1613, 1908).

**Carrot pomace.** Frozen carrot pomace was obtained from Grimmway Family Farms (Arvin, CA, USA). It was freeze-dried (Harvest Right Freeze Dryer, Salt Lake City, UT, USA) at  $-20\text{ }^{\circ}\text{C}$  and 6.67 Pa for 24 h and ground using a commercial spice grinder (VEVOR 2500 g Electric Grain Mill Grinder, Sacramento, CA, USA) to pass through a 20-mesh sieve (0.85 mm).

**Broiler management.** A total of 360 one-day-old, unsexed Ross 708 broiler chicks were obtained from a commercial hatchery. All birds were vaccinated against Newcastle disease, Marek disease, and infectious bronchitis. Upon arrival, chicks were weighed and sorted into 24 floor pens (1.2 m<sup>2</sup> of area per pen, wood shaving) of 15 birds each. Each pen was randomly allocated to one of three dietary treatments (8 pens/treatment) consisting of corn-soybean meal-based diets containing graded levels of carrot pomace: 0 % (control), 4 %, or 8 %. Diets were formulated to meet or exceed the nutrient requirements recommended by the NRC (1994) and Ross 708 Broilers nutritional guidelines (Aviagen, 2019) for a three-phase feeding program: Starter (d 1-14), Grower (d 15-28), and Finisher (d 29-42). Water was provided *ad libitum* via nipple drinkers. Feed intake and body weight were recorded weekly throughout the six-week trial.

**Statistical Analysis.** All statistical analyses were performed using JMP Pro 17 (SAS Institute Inc., Cary, NC). Data were analyzed with a one-way repeated measures ANOVA, with dietary treatment as the main effect, age (week) as the repeat, and pen was the experimental unit. Statistical significance was considered at  $P < 0.05$ . Data are reported as means  $\pm$  SEM.

## Results

There was no significant treatment effect of dietary carrot pomace on body weight (Figure 1) and body weight gain (Figure 2) of the broilers until weeks 5 and 6, when broiler fed diets containing 8% carrot pomace had reduced body weight and body weight gain.

## Conclusions and Recommendations

This study provides preliminary evidence that carrot pomace can be a useful feed ingredient for broiler chickens at low dietary inclusion rates (4%). Future research should examine optimal inclusion ranges and costs for carrot pomace in broiler diets.

## References

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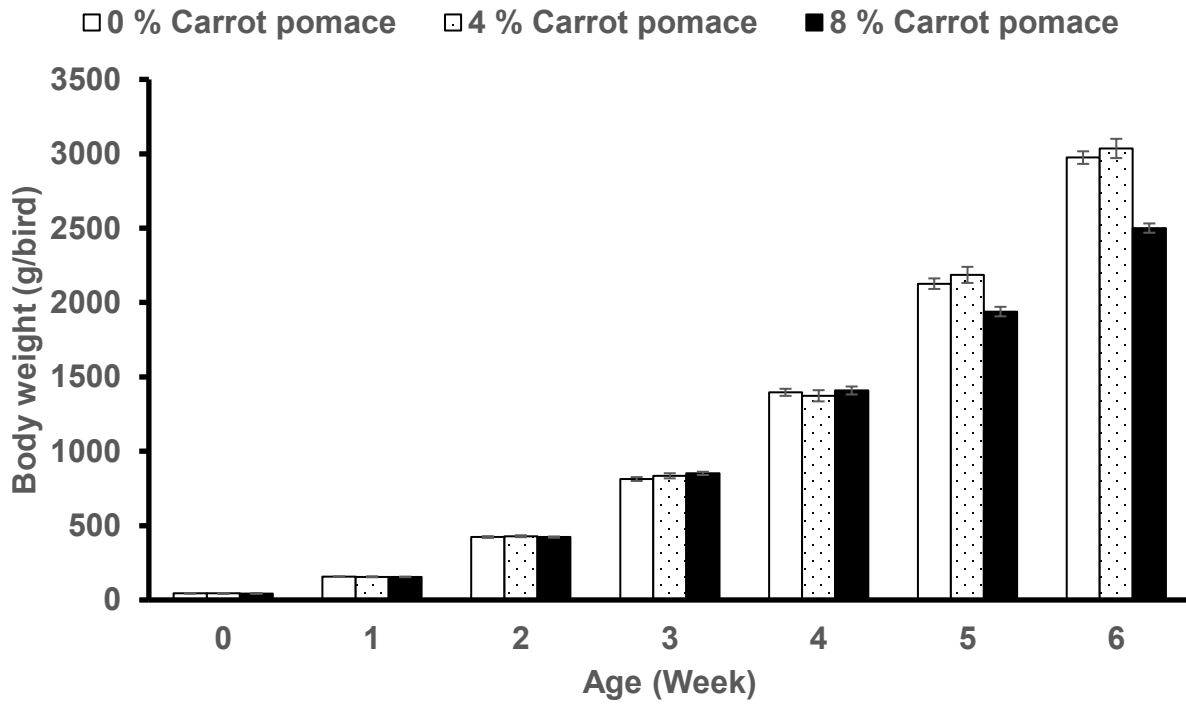


Figure 1. Effect of dietary carrot pomace on body weight of Ross 708 broiler chickens over the course of 6 weeks (n = 8 pens/dietary treatment). Data are presented as means  $\pm$  SEM.

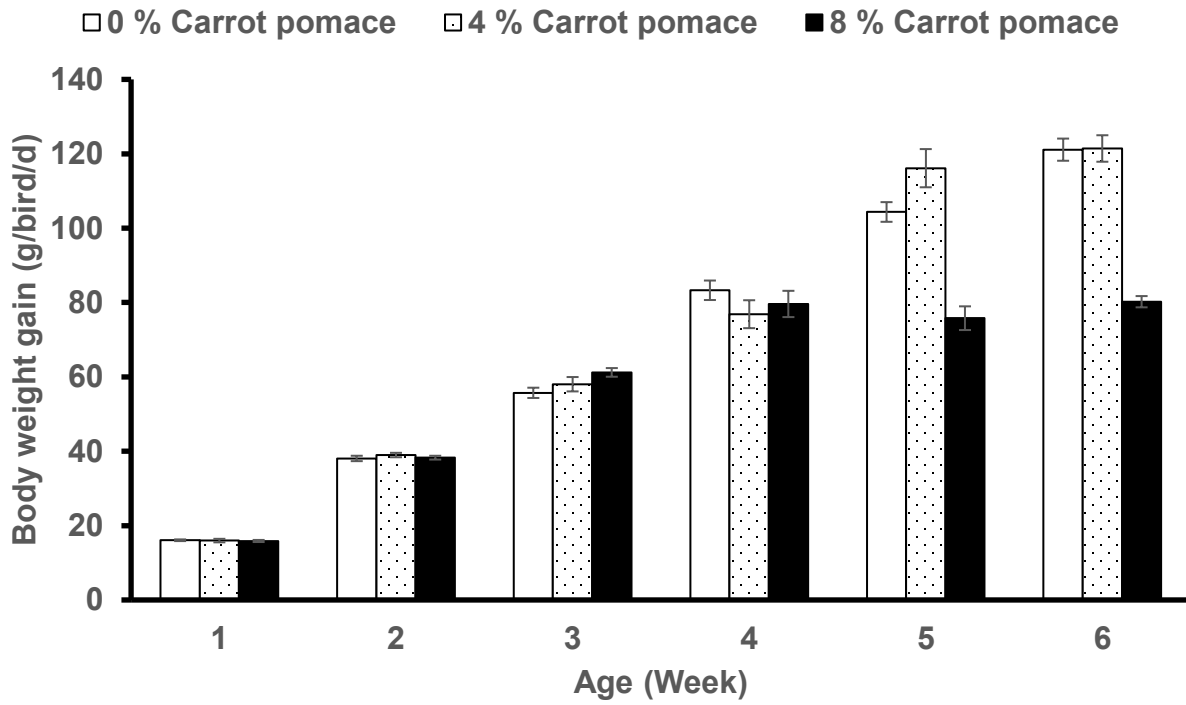


Figure 2. Effect of dietary carrot pomace on body weight gain of Ross 708 broiler chickens over the course of 6 weeks (n = 8 pens/dietary treatment). Data are presented as means  $\pm$  SEM.

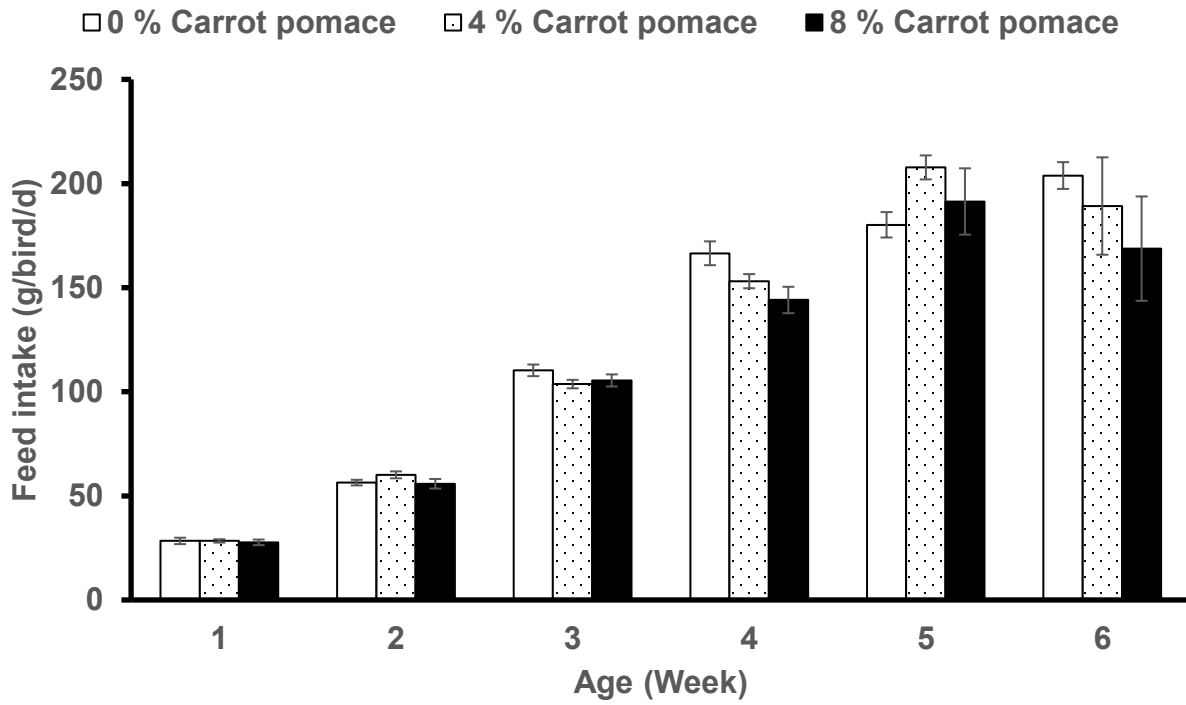


Figure 3. Effect of dietary carrot pomace on feed intake of Ross 708 broiler chickens over the course of 6 weeks (n = 8 pens/dietary treatment). Data are presented as means  $\pm$  SEM.

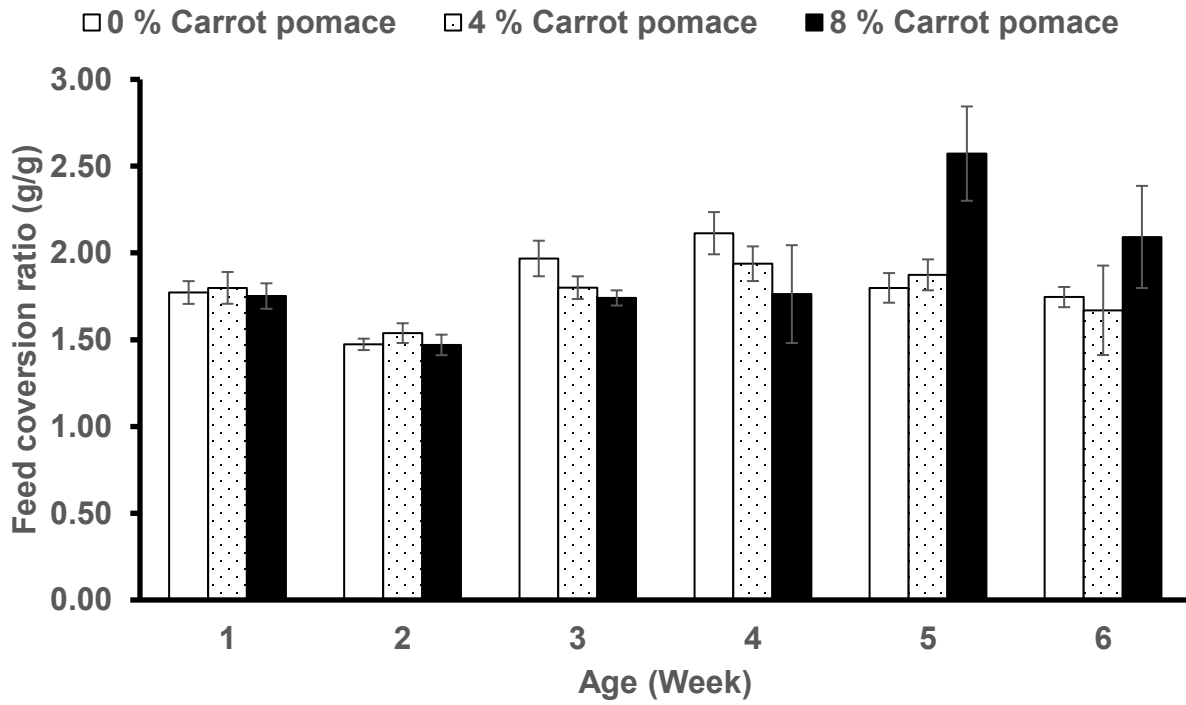


Figure 4. Effect of dietary carrot pomace on feed conversion ratio of Ross 708 broiler chickens over the course of 6 weeks (n = 8 pens/dietary treatment). Data are presented as means  $\pm$  SEM.