Optimal Inclusion Level of Cassava Residue in Diets for 50- to 70-Day-Old Goslings (Postprint)

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Date: 2017-10-10T00:00:00+00:00

Abstract

This experiment was conducted to determine the optimal supplementation level of cassava residue in diets for goslings aged 50-70 days. A total of 200 healthy Yangzhou ganders at 49 days of age with similar body weight were randomly allocated to 5 groups, each consisting of 4 replicates with 10 geese per replicate. The control group was fed a basal diet, while the experimental groups were fed experimental diets supplemented with 5%, 10%, 15%, and 20% cassava residue, respectively, for a 21-day experimental period. The results showed that: 1) Compared with the control group, dietary supplementation of cassava residue significantly reduced the apparent metabolic rate of dietary energy in 10-week-old geese ($P<0.05$); dietary supplementation with 10%, 15%, and 20% cassava residue significantly increased the average daily feed intake of goslings during 64-70 days of age and 50-70 days of age ($P<0.05$); dietary supplementation with 15% and 20% cassava residue significantly increased the average daily gain of goslings during 50-56 days of age ($P<0.05$); dietary supplementation with 20% cassava residue significantly decreased the abdominal fat percentage of goslings ($P<0.05$) and significantly increased the crude ash content in muscle ($P<0.05$). 2) Dietary cassava residue supplementation had no significant effect on other slaughter performance traits, apparent metabolic rate of dietary nutrients, meat quality, or conventional nutrient content in muscle of goslings ($P>0.05$). 3) According to the quadratic relationship exhibited by feed cost reduction percentage and economic benefit, the maximum feed cost reduction percentage was achieved when cassava residue supplementation reached 21.4%; the highest economic benefit was obtained at 20.9% cassava residue supplementation. Therefore, dietary cassava residue supplementation can promote growth in goslings without significantly affecting slaughter performance, apparent metabolic rate of dietary nutrients, meat quality, or conventional nutrient content in muscle. Based on comprehensive analysis of growth performance, slaughter performance, apparent nutrient utilization of diets, and economic benefit, the appropriate supplementation level of cassava residue in diets for goslings aged 50-70 days is 20%.

Full Text

Optimum Supplemental Level of Cassava Residues for Geese at 50 to 70 Days of Age

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Abstract

This experiment aimed to investigate the optimum supplemental level of cassava residues in diets for geese aged 50 to 70 days. Two hundred healthy 49-day-old male Yangzhou geese with similar body weight were randomly allocated into five groups, each consisting of four replicates of ten geese. The control group received a basal diet, while experimental groups were fed diets supplemented with 5%, 10%, 15%, and 20% cassava residues for a 21-day trial period. The results showed: (1) Compared with the control, dietary cassava residues significantly reduced the apparent metabolizable energy of diets in 10-week-old geese ($P<0.05$). Supplementation with 10%, 15%, and 20% cassava residues significantly increased average daily feed intake (ADFI) during 64-70 days and 50-70 days of age ($P<0.05$). Diets with 15% and 20% cassava residues significantly improved average daily gain (ADG) during 50-56 days of age ($P<0.05$). The 20% cassava residue diet significantly reduced abdominal fat percentage and increased crude ash content in muscle ($P<0.05$). (2) Cassava residue supplementation had no significant effects on other slaughter performance metrics, nutrient apparent utilization, meat quality, or conventional nutrient content in muscle ($P>0.05$). (3) Quadratic regression analysis of feed cost reduction percentage and economic benefit indicated maximum feed cost reduction at 21.4% cassava residue inclusion and maximum economic benefit at 20.9% inclusion. Therefore, dietary cassava residues can promote growth in goslings without significantly affecting slaughter performance, nutrient apparent utilization, meat quality, or muscle nutrient content. Based on comprehensive analysis of growth performance, slaughter performance, nutrient utilization, and economic benefit, the appropriate supplemental level of cassava residues in diets for 50-70 day-old goslings is 20%.

Keywords: cassava residues; geese; growth performance; slaughter performance; economic benefits

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Cassava residues are by-products of cassava processing for alcohol and starch production. As a key crop in China' s energy development strategy during the 11th Five-Year Plan period, cassava generates residues rich in cellulose and trace elements, particularly copper, zinc, and manganese. Utilizing cassava residues as a feed ingredient can alleviate feed resource shortages, reduce feed costs, and

improve economic returns in animal production, demonstrating considerable development potential. Recent years have witnessed growing interest in developing new feed resources, with cassava residues emerging as a research hotspot in animal production.

Previous studies have investigated the effects of cassava residues on various animal species. Ai Biyan et al. and Qiao Xingfang et al. examined the impacts of dietary cassava residues and fermented cassava residues on blood biochemical and metabolic hormone indices in growing Huoyan geese, finding no significant effects. However, research on the optimal inclusion level of cassava residues in gosling diets remains unreported. This study investigates the effects of different dietary cassava residue levels on production performance, slaughter performance, nutrient metabolism, and meat quality in 50-70 day-old goslings, while considering feed costs and economic benefits, to determine the appropriate supplemental level and provide reference for rational use in Yangzhou goose diets.

1.1 Experimental Animals and Design

Two hundred 49-day-old male Yangzhou goslings from the same hatch, raised under identical management conditions and with similar body weight, were selected and marked with leg tags. The geese were randomly divided into five groups with four replicates each containing ten birds. The control group received a basal diet, while experimental groups were fed diets supplemented with 5%, 10%, 15%, and 20% cassava residues for a 21-day experimental period. All geese had ad libitum access to feed and water throughout the trial.

1.2 Experimental Diets

Cassava residues were purchased from Huainan Nanda Animal Nutrition Technology Co., Ltd., with all residues from the same production batch. The composition and nutritional levels of cassava residues, determined using conventional methods, are presented in Table 1 .

Diet formulation referenced NRC (1994) standards, the former Soviet Union Institute of Animal Husbandry (1985), Australian meat goose requirements, and research findings from the Poultry Science Department of Yangzhou University to create experimental diets with similar nutritional levels. The composition and nutritional levels of experimental diets are shown in Table 2 .

Table 1. Composition and Nutritional Levels of Cassava Residues

Item	Content	Item	Content	Item	Content
Dry matter	-	Crude protein	-	Gross energy (MJ/kg)	-
Aspartic acid	-	Proline	-	Glutamic acid	-

Item	Content	Item	Content	Item	Content
Tyrosine	-	Lysine	-	Leucine	-
Serine	-	Valine	-	Crude fat	-
Crude fiber	-	Neutral detergent fiber	-	Acid detergent fiber	-
Crude ash	-	Calcium	-	Glycine	-
Methionine	-	Histidine	-	Cysteine	-
Arginine	-	Isoleucine	-	Threonine	-
Alanine	-	Phenylalanine	-	-	-

Table 2. Composition and Nutritional Levels of Experimental Diets (Air-Dry Basis), %

Item	Cassava Residue Supplemental Level/%
Ingredients	
Corn	-
Soybean meal	-
Alfalfa meal	-
Wheat bran	-
Cassava residues	0, 5, 10, 15, 20
Premix[1]	-
$CaHPO_4$	-
Limestone	-
NaCl	-
Met	-
Total	100
Nutrient Levels[2]	
Metabolizable energy (MJ/kg)	-
Crude protein	-
Crude fiber	-
Calcium	-
Total phosphorus	-
Lysine	-
Methionine	-

[1]The premix was provided by Yangzhou University Feed Company, containing per kg: VA 1,200,000 IU, VD 400,000 IU, VE 1,800 IU, VK 150 mg, VB_1 60 mg, VB_2 600 mg, VB_6 200 mg, VB_{12} 1 mg, nicotinic acid 3 g, D-pantothenic acid 900 mg, folic acid 50 mg, biotin 4 mg, choline 35 g, Fe (as ferrous sulfate)

6 g, Cu (as copper sulfate) 1 g, Mn (as manganese sulfate) 9.5 g, Zn (as zinc sulfate) 9 g, I (as potassium iodide) 50 mg, Se (as sodium selenite) 30 mg.
[2]Nutrient levels were calculated values.

1.3 Management Practices

The experiment was conducted at the Experimental Farm of Yangzhou University from July 21 to August 10, 2014. Geese were raised on wire floors with ad libitum access to feed and water. Pens were maintained clean, dry, and well-ventilated.

1.4 Measurements

1.4.1 Growth Performance Body weight and feed consumption were measured at the end of 56, 63, and 70 days of age after 6-hour fasting. Average daily gain (ADG), average daily feed intake (ADFI), and feed-to-gain ratio (F/G) were calculated.

1.4.2 Slaughter Performance At the end of the trial (70 days of age), two geese per replicate (40 total) with body weight close to the replicate average were selected. After 6-hour fasting, body weight was recorded before slaughter. Following bleeding and feather removal, slaughter indices were measured: half-eviscerated weight, eviscerated weight, breast muscle weight, leg muscle weight, and abdominal fat weight. Half-eviscerated yield percentage, eviscerated yield percentage, breast muscle percentage, leg muscle percentage, and abdominal fat percentage were calculated according to NY/T 823-2004 "Poultry Production Performance Terminology and Measurement Methods."

1.4.3 Meat Quality and Muscle Conventional Nutrients At trial conclusion (70 days of age), two geese per replicate (40 total) with body weight close to the replicate average were selected. After 6-hour fasting and weighing, geese were slaughtered and bled. Left-side breast and leg muscles were separated. Breast muscle was used to determine pH, meat color, shear force, and drip loss percentage. Leg muscle was used to determine moisture, crude protein, crude fat, and crude ash content.

pH Determination: pH was measured at 15 minutes post-slaughter using a pH meter probe at the muscle center.
Meat Color: Measured using an Opto-Star meat color meter post-slaughter.
Tenderness: Fresh breast muscle samples were cut into strips (1 cm wide, 0.5 cm thick) without fascia, fat, or muscle membrane. Shear force was measured using a C-LM3 muscle tenderness meter, with three measurements averaged.
Water Loss Rate (Drip Loss Method): At 2-3 hours post-slaughter, breast muscle samples (80-100 g, ~2 cm thick) were trimmed and external membranes removed. After weighing, samples were suspended with muscle fibers vertical in aerated sealed bags at 4°C for 24 hours, then surface moisture was blotted

and samples were reweighed. Water loss rate (%) = [(pre-hanging weight - post-hanging weight) / pre-hanging weight] × 100.

1.4.4 Dietary Nutrient Utilization During the feeding trial, one goose per replicate with body weight close to the replicate average was selected at 64 days of age for a metabolism trial. Geese were housed in metabolism cages with collection trays underneath. Ad libitum feed and water were provided during adaptation and collection periods, with frequent feed additions to prevent spillage into collection trays. Total collection method was used to collect excreta, with skin scales and feathers removed. Excreta from the same goose over 4 days were mixed uniformly. Ten mL of 10% HCl was added per 100 g fresh feces to prevent ammonia nitrogen loss. Fresh feces were dried at 65°C, equilibrated at room temperature for 24 hours, weighed, and ground through a 40-mesh sieve to create air-dried fecal samples.

Apparent nutrient utilization (%) = 100 - 100 × [(b/a) × (c/d)], where: a = nutrient content in diet (%); b = nutrient content in feces (%); c = endogenous indicator content in diet (%); d = endogenous indicator content in feces (%).

1.4.5 Economic Benefit ADFI and ADG from 50-70 days of age were recorded. Raw material prices and goose selling prices were based on actual purchase and sale values. Total feed cost per kg weight gain and daily economic benefit per bird were calculated.

Feed cost per kg weight gain = (ADFI × diet price) / ADG
Daily economic benefit per bird = (ADG × goose price) - (ADFI × diet price)

1.5 Statistical Analysis Data were compiled in Excel 2007 and analyzed using one-way ANOVA in SPSS 19.0 to test for group differences and effects, with linear and quadratic regression analysis performed. $P<0.05$ was considered statistically significant.

2.1 Effects of Dietary Cassava Residues on Growth Performance of Geese at 50-70 Days of Age

As shown in Table 3 , dietary cassava residues significantly increased ADG of goslings during 50-56 days of age ($P<0.05$) with a linear relationship ($P=0.001$), though 5% and 10% cassava residue groups did not differ significantly from the control ($P>0.05$). Cassava residues significantly increased ADFI during 57-63 days of age ($P<0.05$) with a linear relationship ($P=0.001$), with 15% and 20% groups significantly higher than 5% and control groups ($P<0.05$). During 64-70 days of age, cassava residues significantly increased ADFI ($P<0.05$) with a linear relationship ($P=0.001$), with 10%, 15%, and 20% groups significantly higher than 5% and control groups ($P<0.05$). Overall during 50-70 days of age, cassava residues significantly increased ADFI ($P<0.05$) with a linear relationship ($P=0.000$), where 15% and 20% groups were significantly higher than 5%

and control groups (P<0.05), though the 5% group did not differ from control (P>0.05). Feed-to-gain ratios varied among groups at different ages but differences were not significant (P>0.05).

Table 3. Effects of Dietary Cassava Residues on Growth Performance of Geese at 50-70 Days of Age

Item	Cassava Residue Supplemental Level/%	P-value
50-56 days		
ADFI (g)	185.91a, 187.58ab, 200.01bc, 208.53c, 212.26c	Linear: 0.000, Quadratic: NS
ADG (g)	41.34a, 42.49a, 43.72ab, 48.59c, 47.59bc	Linear: 0.001, Quadratic: NS
F/G	-	NS
57-63 days		
ADFI (g)	204.65a, 206.65a, 218.89ab, 230.42b, 231.97b	Linear: 0.001, Quadratic: NS
ADG (g)	-	NS
F/G	-	NS
64-70 days		
ADFI (g)	149.33a, 152.07a, 168.60b, 168.91b, 177.89b	Linear: 0.001, Quadratic: NS
ADG (g)	-	NS
F/G	-	NS

In the same row, values with different superscripts differ significantly (P<0.05). NS = not significant.

2.2 Effects of Dietary Cassava Residues on Slaughter Performance of Geese at 70 Days of Age

As shown in Table 4 , dietary cassava residues significantly affected abdominal fat percentage (P<0.05) with a linear relationship (P=0.009), where the control group had the highest abdominal fat percentage, significantly greater than the 20% cassava residue group (P<0.05). Cassava residues tended to increase eviscerated yield percentage (P=0.095) with a significant linear relationship (P=0.011). No significant effects were observed on dressing percentage, half-eviscerated yield percentage, eviscerated yield percentage, leg muscle percentage, or breast muscle percentage (P>0.05).

Table 4. Effects of Dietary Cassava Residues on Slaughter Performance of Geese at 70 Days of Age, %

Item	Cassava Residue Supplemental Level/%	P-value
Dressing percentage	-	NS
Half-eviscerated yield percentage	-	NS
Eviscerated yield percentage	-	Linear: 0.011, Quadratic: NS
Leg muscle percentage	-	NS
Breast muscle percentage	-	NS
Abdominal fat percentage	2.79a, 2.66a, 2.57ab, 2.43ab, 2.02b	Linear: 0.009, Quadratic: NS

2.3 Effects of Dietary Cassava Residues on Meat Quality and Conventional Nutrient Content in Muscle of Geese at 70 Days of Age

As shown in Table 5 , dietary cassava residues significantly affected crude ash content in muscle (P<0.05), with the 20% cassava residue group differing sig-

nificantly from other groups (P<0.05) and showing a quadratic relationship (P=0.001). No significant effects were observed on meat quality or other conventional nutrient contents (P>0.05).

Table 5. Effects of Dietary Cassava Residues on Meat Quality and Conventional Nutrient Content in Muscle of Geese at 70 Days of Age, %

Item	Cassava Residue Supplemental Level/%	P-value
Meat color	-	NS
Water loss rate (%)	-	NS
Shear force (N)	59.23	NS
Water (%)	-	NS
Crude protein (%)	-	NS
Crude fat (%)	-	NS
Crude ash (%)	1.48a, 1.35a, 1.29a, 1.38a, 1.73b	Linear: NS, Quadratic: 0.001

2.4 Effects of Dietary Cassava Residues on Apparent Nutrient Utilization of Diets in Geese at 10 Weeks of Age

As shown in Table 6 , dietary cassava residues significantly affected apparent dry matter utilization (P<0.05) with a linear relationship (P=0.000), with 10%, 15%, and 20% groups significantly lower than control (P<0.05), and the 20% group showing the lowest utilization. Cassava residues significantly affected apparent energy utilization (P<0.05) with both linear (P=0.002) and quadratic (P=0.001) relationships, with 10% and 15% groups significantly lower than 5% and control groups (P<0.05), and all treatment groups significantly lower than control (P<0.05). No significant effects were observed on apparent utilization of other nutrients (P>0.05).

Table 6. Effects of Dietary Cassava Residues on Apparent Nutrient Utilization of Diets in Geese at 10 Weeks of Age

Item	Cassava Residue Supplemental Level/%	P-value
Dry matter	66.94a, 61.61ab, 57.82bc, 52.88cd, 51.89d	Linear: 0.000, Quadratic: NS
Crude protein	-	NS
Crude fat	-	NS
Crude fiber	-	NS
Calcium	-	NS
Gross energy	75.45a, 70.90b, 66.35c, 66.87c, 69.93bc	Linear: 0.002, Quadratic: 0.001

2.5 Economic Benefits of Dietary Cassava Residues for Geese at 50-70 Days of Age

Economic analysis is presented in Table 7 . Ingredient prices were based on market values: corn 2.53 yuan/kg, soybean meal 3.88 yuan/kg, wheat bran 1.88 yuan/kg, alfalfa meal 1.75 yuan/kg, cassava residues 0.85 yuan/kg, $CaHPO_4$ 10 yuan/kg, premix 5 yuan/kg, limestone 0.22 yuan/kg, NaCl 0.28 yuan/kg, and methionine 48 yuan/kg. Replacing portions of corn and alfalfa meal with cassava residues reduced diet costs by 0.075, 0.151, 0.223, and 0.292 yuan/kg for 5%, 10%, 15%, and 20% inclusion levels, respectively. Feed cost per kg weight gain decreased by 2.093%, 7.834%, and 7.783% for 10%, 15%, and 20% groups compared with control. Daily economic benefit per bird increased by 11.814%, 43.499%, and 41.904% for 10%, 15%, and 20% groups, respectively. Quadratic regression of cost reduction and benefit increase yielded equations: $y = -8.922 + 1.586x - 0.037x^2$ ($R^2 = 0.950$) and $y = -50.963 + 9.140x - 0.219x^2$ ($R^2 = 0.947$), predicting optimal inclusion levels of 21.4% for minimum feed cost and 20.9% for maximum economic benefit.

Table 7. Economic Cost Statistics of Dietary Cassava Residues for Geese at 50-70 Days of Age

Item	Cassava Residue Supplemental Level/%
Diet cost (yuan/kg)	-
ADFI (kg)	-
ADG (kg)	-
Daily diet cost per bird (yuan)	-
Weight gain diet cost per kg (yuan/kg)	-

Item	Cassava Residue Supplemental Level/%
Weight gain cost reduction ratio (%)	-
Goose price (yuan/kg)	-
Daily weight gain benefit per bird (yuan)	-
Daily economic benefit per bird (yuan)	-
Benefit increase ratio (%)	-

3.1 Effects of Dietary Cassava Residues on Growth Performance of Geese at 50-70 Days of Age

Previous research has demonstrated that various residue-based ingredients can achieve favorable results in poultry production. Cassava residues contain up to 19.13% crude fiber, which limits their inclusion rate in livestock and poultry diets. Khempaka et al. reported that 8% dried cassava pulp was optimal as an energy feed in broiler diets. Ferreira et al. found that 118.75-200.00 g/kg cassava residues improved body weight and feed conversion in 22-42 day-old Ross broilers under high temperature conditions. Wei Jinyi et al. observed that geese preferred fermented cassava residue mixed with grasses and showed significant weight gain. Feed intake in poultry is influenced by breed, diet, environment, and feeding techniques. The cassava alcohol production process involves fermentation that retains volatile aromatic compounds such as alcohols, aldehydes, and esters, which may increase feed intake. In practice, cassava residues emit a distinct aroma upon opening, and feeding observations revealed that geese showed progressively greater feeding enthusiasm as inclusion levels increased. Consequently, feed intake increased with higher cassava residue supplementation. This trial demonstrated that cassava residues improved feed intake and promoted growth in 50-70 day-old goslings, with significant improvements in ADG and ADFI evident during the first week of supplementation, though effects diminished over time. The substantial reduction in ADFI during 63-70 days across all groups likely resulted from heat stress, as daytime temperatures exceeded 35°C, significantly reducing ADG.

3.2 Effects of Dietary Cassava Residues on Slaughter Performance of Geese at 70 Days of Age

Slaughter performance indices reflect differences in nutrient deposition among animal tissues and body parts, influenced by multiple factors. Cahaner et al. reported moderate to strong phenotypic and genetic correlations between abdominal fat and carcass fat, where abdominal fat deposition reflects whole-body fat metabolism dynamics. Wan Jianmei et al. suggested that differences in dietary fiber levels may cause variations in nutrient deposition. Zhang Yajun demonstrated that different fiber levels (5.8-6.7%) affected slaughter performance in Yangzhou geese, with better performance at 12 weeks when fiber was within this range. This study found that appropriate cassava residue levels did not significantly affect most slaughter indices, though 20% supplementation significantly

reduced abdominal fat percentage compared with control, possibly related to altered fat metabolism or reduced apparent fat utilization and increased endogenous losses due to higher dietary fiber content. These results align with Khempaka et al.' s findings that dried cassava residues reduced abdominal fat percentage in broilers.

3.3 Effects of Dietary Cassava Residues on Meat Quality and Conventional Nutrient Content in Muscle of Geese at 50-70 Days of Age

Miller defined meat quality as the physical and chemical characteristics of fresh and processed meat related to processing and consumption, including appearance, flavor, nutrition, and hygiene. Sensory evaluation primarily assesses pH, meat color, tenderness, and water loss rate. Limited research exists on goose meat quality parameters, with normal ranges yet to be established. Li Xiaojuan reported Yangzhou goose muscle pH of 5.89-6.12 with dietary DDGS, while Xie Kaizhou et al. reported pH 5.78 and shear force 6.03 kg (~59.09 N) in 70-day-old Yangzhou geese. This trial found pH 5.62-5.75, meat color 79.87-85.13, shear force 52.24-60.05 N, and drip loss 3.72-4.66%, with no significant differences between treatment and control groups, indicating that cassava residues did not adversely affect meat pH, color, tenderness, or water loss. Shear force values were lower in 5%, 10%, and 15% groups than control, suggesting appropriate cassava residue levels may slightly improve muscle tenderness.

Muscle chemical composition reflects intrinsic meat quality, with differences among livestock species primarily caused by variations in moisture, fat, and protein content. Higher moisture content generally indicates lower dry matter and nutrient content, though appropriate moisture levels influence juiciness, palatability, and tenderness. Intramuscular fat positively affects tenderness, juiciness, and flavor, while protein content is critical for meat quality. Goose meat is rich in minerals including calcium, phosphorus, and iron. This study found significantly higher ash content in leg muscle of the 20% cassava residue group compared with control, likely because cassava residues retain organic acids such as malic, acetic, and lactic acids that are used as feed acidifiers to regulate intestinal pH. Reduced gastrointestinal pH enhances pepsin activity, nutrient solubility, and mineral absorption. Therefore, cassava residues can increase mineral content and nutritional value in leg muscle, though the specific ash composition and formation mechanisms require further investigation.

3.4 Effects of Dietary Cassava Residues on Apparent Nutrient Utilization of Diets in Geese at 50-70 Days of Age

Accurate determination of digestible nutrient content is crucial for evaluating feed nutritional value. Dry matter serves as the carrier for nutrients, particularly the three major energy sources: carbohydrates, protein, and fat, with nutrient metabolism inevitably accompanied by energy metabolism. Wang Baowei et al. reported crude fiber, neutral detergent fiber, and acid detergent fiber utilization rates of 17.15-25.35%, 21.04-30.71%, and 19.10-28.08%, respectively, in

3-month-old Wulong geese fed diets with 5.41-12.05% crude fiber from alfalfa meal. This trial found that apparent nutrient utilization in 10-week-old geese decreased with increasing cassava residue levels, likely due to high crude fiber content in cassava residues. Dietary fiber not only has low digestibility itself but also negatively affects digestion and absorption of other nutrients, exhibiting anti-nutritional effects. Liu Gang et al. reported that increasing dietary fiber levels decreased utilization of energy, crude protein, and crude fat. Fiber affects feed retention time and rate in the digestive tract, thereby influencing nutrient utilization. This study demonstrated that apparent utilization of dry matter, crude protein, crude fat, energy, calcium, and phosphorus decreased with increasing cassava residue levels, with dry matter showing the most pronounced reduction and significant differences from control, consistent with previous research. The slightly higher energy utilization in the 20% group compared with 10% and 15% groups may reflect relatively higher crude fiber utilization, though the underlying mechanisms require further investigation.

3.5 Economic Benefits of Dietary Cassava Residues for Geese at 50-70 Days of Age

Yu Xiangchun et al. reported that 15% fermented cassava residue powder replacing 9% corn, 3% peanut meal, and 3% wheat bran was feasible in Wenchang chicken diets, achieving good weight gain and reduced feeding costs. Feng Xiangren et al. found that 10% and 20% microbial fermented cassava residues in 28-day-old Sanhuang chicken diets increased gross profit by 28.36% and 26.63%, respectively, compared with control. Jiang Jiansheng et al. demonstrated that 5% fermented cassava residue replacing part of complete feed yielded the highest profit (4.49 yuan/bird) in meat ducks, followed by 3% and 1% replacement groups (4.32 and 3.49 yuan/bird), all significantly higher than the control (2.31 yuan/bird). This trial indicated that low cassava residue inclusion failed to reduce feed costs due to increased feed intake and reduced feed conversion, while excessive inclusion markedly decreased nutrient utilization and impaired growth. Quadratic regression analysis of cost reduction and benefit increase suggested optimal inclusion levels of 20.9-21.4% for 50-70 day-old goslings.

Conclusions

1. Appropriate dietary cassava residue levels can increase feed intake, promote growth, reduce feed costs, and improve economic benefits in 50-70 day-old goslings without significantly affecting slaughter performance. At 20% inclusion, cassava residues increased crude ash content in muscle and reduced abdominal fat percentage.

2. Dietary cassava residues decreased apparent utilization of dry matter and energy in 10-week-old geese but had no significant effects on utilization of other nutrients.

3. Based on comprehensive analysis of growth performance, slaughter perfor-

mance, nutrient utilization, and economic benefits, the appropriate supplemental level of cassava residues in diets for 50-70 day-old goslings is 20%.

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Note: Figure translations are in progress. See original paper for figures.