

Harnessing poultry slaughter waste for sustainable pet nutrition: a catalyst for growth in the pet food industry

Abstract

Dogs, renowned for their social nature and versatile roles in human society, necessitate proper nutrition to maintain health and vitality. With the burgeoning pet food market in India driven by increasing poultry production, there exists an opportunity to address environmental concerns while advancing companion animal nutrition. Currently, disposal of inedible poultry byproducts poses environmental challenges, urging a shift towards sustainable practices. This paper advocates for the utilization of poultry slaughter waste in pet nutrition, highlighting its nutritional benefits and environmental implications. By recycling poultry waste into valuable sources of animal proteins, minerals, and vitamins, the pet food industry can meet the dietary needs of companion animals while mitigating environmental pollution. Furthermore, the incorporation of animal byproducts aligns with carnivores' natural dietary instincts and addresses the limitations of plant-based protein sources. Drawing from established practices in industrialized nations, this paper underscores the potential of poultry slaughter waste utilization to propel the growth of the pet food industry in India. Embracing this sustainable approach not only ensures the well-being of companion animals but also fosters economic development and environmental stewardship in the Indian context.

Keywords: Pet nutrition, Poultry slaughter waste, Sustainable practices, pet food industry

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Introduction

Dogs possess a strong social nature, which contributes to their loyalty, trainability, playfulness, and ability to integrate into human households seamlessly. Given their adaptability, dogs have taken on various roles as needed by humans. They serve in functions such as search and rescue, law enforcement, guarding, herding, guiding the visually impaired, assisting in hunting, and many other tasks. Considering this, proper dog nutrition has become increasingly crucial for their maintenance and healthcare. Dog owners are focusing on nutrition to safeguard their pets and avoid costly medical expenses. Commercial pet food manufacturers are vying for dominance in the market with their customized dog diets.

The Indian pet food market is a burgeoning industry. Currently, it stands at 6,000 tonnes and experiences an annual growth rate of 10 to 15 percent, thanks to the expanding poultry production and processing activities (International Business Strategies, 2005). This growth leads to increased availability of both edible and inedible byproducts. However, the current disposal of inedible byproducts like heads, feet, and viscera results in environmental pollution. Given the stricter environmental regulations and the disapproval of old waste disposal methods by environmentalists, there is a pressing need for change. Nutritionally balanced diets necessitate highly digestible ingredients that provide sufficient nutrients for the proper growth and well-being of companion animals. Animal byproducts have played a significant role in the global pet food industry's growth and expansion. Therefore, recycling poultry slaughter waste into valuable sources of animal proteins, minerals, and vitamins for pet nutrition is highly desirable. This approach not only meets carnivores' natural instincts but also provides all essential amino acids, which are lacking in plant-based protein sources. Plant-based protein sources are generally less diverse than animal-based ones.¹ The pet food industry is well-established in industrialized nations, where animal and poultry byproducts are major contributors to pet foods. Considering this, utilizing poultry slaughter waste could significantly contribute to the growth of the pet food industry in India.

Pet food growth and palatability

Factors influencing pet food growth

²conducted a study on female Beagle puppies, focusing on their growth, feed intake, and feed efficiency ratio. They discovered that adding wheat bran (WB) to puppy diets to achieve a neutral detergent fiber content of 16 percent in a 21 percent crude protein diet did not adversely affect the growth rate of Beagle puppies.³ formed poultry slaughter byproducts to develop cost effective dried pet food. They concluded that the growth of the experimental dogs was comparable to that of the control group. Czarniecki-Maulden et al.⁴ found that the sodium requirement for the growth of dogs was 0.15 g Na/1000 Kcal, which might not be sufficient for lactation.^{5,6} conducted to evaluate the effect of fiber-rich vegetables on the quality characteristics of poultry slaughterhouse byproducts incorporated in pet food. They observed that lactation needs were met with 0.19 g Na/1000 Kcal.⁷ conducted an experiment on 45 Labrador pups and 66 Alsatian pups to examine their growth rates. They reported that Labrador puppies gained a body weight of 61 g/day up to 2 months, 90 g/day up to 4 months, and 115 g/day up to 6 months of age. They presented growth curves for the studied pups and standard growth curves graphically. Kumar et al., 2023. Effect of Binder Inclusion on Poultry Slaughterhouse Byproducts Incorporated Pet Food Characteristics and Palatability Comparing these curves, they noted a significant gap in growth curves for Alsatian pups and a narrower gap for Labrador pups. They attributed the inadequate growth rate of the pups to their genetic makeup.

Palatability in pet food: importance and determinants

⁸reported that dog biscuits made from a mixture of wheat flour, soybean meal, meat meal, vegetable oil, vitamins, and minerals, with a nutritional value of 94.27% OM, 33.77% CP, and 10.79% EE on a dry matter basis, fed to growing Mongrel pups (6-8 weeks old) for three weeks, including a digestibility trial, supported an average daily body weight gain of 97±7g, considered optimal. Kumar et al., 2023 showed that due to disease lots of economic losses to the

formers. They concluded that the complete diet (biscuit) was highly palatable and capable of sustaining normal growth in Mongrel pups.⁹ Enhancing Microbiota Analysis, Shelf-life, and Palatability Profile in Affordable Poultry Byproduct Pet Food Enriched with Diverse Fibers and Binders.² compared the growth curves of 12 different dog breeds to establish a mathematical basis for breed-specific feeding guidelines. They reported that Labrador Retrievers took 18.6 weeks to reach 50% of maximum growth and 52.1 weeks to reach 99% of adult body weight.

Pet nutrition's impact on growth

Nutritional requirements for optimal growth

¹⁰⁻¹² discovered that dietary fiber could decrease the digestibility of organic matter and gross energy. They observed a negative correlation between the content of fiber fractions, including cellulose, and the percentage of organic matter and gross energy.^{5,6,9,13,14} noted that phosphorus in corn, soybean, and other plant seeds primarily exists in the form of phytate, which is poorly available to simple-stomached animals. Fahey^{15,16} found that the digestibility of dry matter (DM) and organic matter (OM) for various fiber treatments (beet pulp, tomato pomace, peanut hulls, wheat bran, wheat straw) was lower than the control. However, they found no significant difference in digestibility among these fiber sources, suggesting that the choice of a fiber source might be influenced by economic factors.^{6,15,16} compared a controlled diet with no added fiber to experimental diets containing 7.5% beet pulp and diets with oat fiber in proportions of 2.5%, 5.0%, and 7.5%. They observed that the inclusion of 7.5% beet pulp increased dry matter intake, but decreased digestibility of dry matter and organic matter compared to the control. Dry matter intake increased with higher levels of oat fiber, while digestibility decreased. Among fiber sources, they concluded that dry matter and organic matter digestibility were higher for dogs fed with 7.5% beet pulp than those fed with 7.5% oat fiber.^{9,17} conducted an experiment to assess the nutritional adequacy of pet foods for different life stages. They reported that the bioavailability of fat-soluble vitamins might not be a serious concern due to the high apparent digestibility of lipids by dogs and cats.

^{18,19} found that a carbohydrate-rich (raw starch) diet reduced fecal pH and protein digestibility in cat foods, but the lactose present in the diet enhanced calcium absorption.¹⁹ studied digestibility over different collection periods (4-7 days, 8-14 days, and 15-21 days) and found no significant differences in any of the variables measured in dogs.^{1,14} reported that dog food containing high-quality animal products had higher digestibility than plant-based food, but the quality of animal byproducts varied. Diets containing minimal soybean oligosaccharide improved digestibility and fecal quality compared to those containing soybean grits, soybean flour, and soybean protein concentrate.^{14,20-22} reported that the apparent digestibility of crude protein was lower in a controlled diet (poultry meal) than diets containing soybean meal (SBM). However, diets containing SBM resulted in higher fecal moisture concentrations and greater fecal volumes. They also found that the apparent digestibility of essential amino acids in poultry byproduct meal (PBPM) averaged 69.7% in dogs.¹⁰ reported no statistically significant difference in major nutrient digestibility between certified and non-certified pet foods, although some non-certified dog foods consistently failed to meet recommended levels for protein, calcium, and zinc.

Impact of nutrition on growth parameters

^{7,18} found that the digestibility of dry matter, organic matter, crude protein, fat, and gross energy at the ileum was higher in diets containing fresh poultry than those containing poultry byproduct meal

(PBPM). However, under processed feathers present in PBPM could decrease digestibility. They reported a higher apparent digestibility of essential amino acids (81.0%) in PBPM compared to a previous study.²³ compared textured vegetable protein from soy (TVP) with beef and found that prececal and total tract intestinal protein digestibility decreased slightly with TVP. The digestibility of sodium and potassium also decreased, while fat digestibility remained unaffected.^{4,18} compared ileal and fecal digestibility of dietary protein and found that fecal digestibility overestimated digestibility compared to ileal digestibility.^{10,16} found that low levels of supplemental fructans in dog diets had divergent effects on nutrient digestibility and fermentative end products but did not adversely affect nutrient digestibility or fecal characteristics and may improve colonic microbial ecology.¹⁸ and ^{12,21,22} noted that proteins of plant origin typically have lower digestibility than animal proteins due to factors such as plant fiber and carbohydrates, which slow digestion and increase bacterial activity.^{21,22} found that spray-dried animal plasma (SDAP) improved the digestibility of organic matter in dry dog food and reduced fecal dry matter excretion.^{10,23} found that high amylose corn hybrids were poorly digested, whereas high-protein corn hybrids showed good digestibility in dogs.^{1,17} evaluated different protein sources in dry cat food and found that chicken meal had intermediate dry matter digestibility and nitrogen utilization compared to meat meal and corn gluten meal.^{18,24} reported that energy digestibility in dog and cat food could be predicted by the linear regression of fiber content on a dry matter basis. High fiber content often correlates with lower digestibility and may impair the digestibility of other nutrients, especially in foods with a high percentage of crude plant material.

Conclusion

The growth of the pet food industry has been significant, driven by factors such as urbanization, economic liberalization, media influence, and owners' awareness of the importance of balanced pet nutrition. With the increasing trend towards nuclear families and the rising demand for companion animals, the market for pet food continues to expand rapidly. Commercial pet food manufacturers have capitalized on this growth by offering tailor-made diets that cater to the specific nutritional needs of pets. One of the key considerations in the development of pet food is palatability. Pet owners prioritize the palatability of pet food to ensure that their animals enjoy and consume it readily. Manufacturers have responded to this demand by formulating pet foods with flavors and textures that appeal to pets, thereby enhancing their acceptance and consumption. Additionally, research into pet food palatability has led to advancements in ingredient selection and processing techniques, further improving the taste and texture of pet foods. Studies have shown that factors such as protein quality, fat content, and the inclusion of flavor enhancers play crucial roles in enhancing palatability. Furthermore, the pet food industry continuously innovates to meet consumer preferences and address emerging trends. This includes the development of novel ingredients, formulations, and delivery systems that not only enhance palatability but also offer nutritional benefits and convenience to pet owners.

The growth of the pet food industry is intricately linked to the emphasis on palatability, as pet owners seek nutritious yet appealing food options for their beloved companions. By understanding and catering to the preferences of both pets and their owners, the pet food industry is poised for continued growth and innovation in the years to come.

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Conflicts of interest

The authors confirm that this article content has no conflict of interest, the authors declare that there are no conflicts of interests regarding the publication of this manuscript.

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