

Pearl Millet: A Climate-Smart and Sustainable Alternative to Traditional Poultry Feed

Harsh Deep, Dev Vart Yadav, Rao Pankaj, Prakhar Singla and Pawan Kumar*

Department of Genetics and Plant Breeding, CCS HAU, Hisar

Corresponding Author: pawankumargpb1502@gmail.com

Introduction

Poultry plays a crucial role in global food production, nutrition, and economic development. Poultry products are excellent sources of high-quality protein, essential vitamins (such as B vitamins), and minerals (such as iron and zinc). The poultry industry in India has seen steady growth due to increasing demand for protein-rich foods, changing dietary habits, and urbanization. As per the 20th livestock census of India, the poultry sector experienced a remarkable growth rate of 16.81 % between the years 2012 to 2019, which is substantially greater than overall livestock growth in India *i.e* 4.82% (Department of Animal Husbandry and Dairying, Annual report, 2022-23).

The predicted growth of the poultry industry will indeed come with multiple challenges, particularly regarding the availability and sustainability of raw materials for feed production. The feed cost incurs about 60–65 percent of the total cost of poultry production. Therefore, for more profit poultry industry needs to adopt sustainable feed sourcing practices, and invest in research and innovation to develop alternative feed ingredients. The poultry industry can reduce dependency on traditional feed ingredients like soybean meal and corn, by diversifying feed sources and incorporating alternative raw materials into feed formulations. In this context, the evaluation and use of alternative raw materials is an important strategy for the industry to expand in the future.

Problem with traditional poultry feed

By far maize have been the primary components of poultry feed globally as well as in India because of its easy availability and cost-effectiveness. While maize is high in energy, it is low in protein and essential amino acids such as lysine and methionine. This imbalance can affect the growth and productivity of poultry if not properly supplemented with other protein sources (Dei *et al.*, 2017). Large-scale maize cultivation can contribute to environmental issues such as soil degradation, water usage, and pesticide

use. This raises concerns about the sustainability of maize-based poultry diets.

Pearl millet as an alternate of maize in poultry feed

The poultry industry can reduce dependency on traditional feed ingredients like maize by diversifying feed sources and incorporating alternative raw materials into feed formulations. In this scenario Pearl millet can be a very good alternate. Pearl millet is known for its higher crude protein content compared to maize. The crude protein content in pearl millet ranges from approximately 8.6% to 19.4%, whereas maize typically contains about 8% to 10% crude protein. Pearl millet has a more favorable amino acid profile, especially in terms of essential amino acids like methionine and lysine, which are crucial for poultry growth and egg production. These amino acids are often limiting in maize-based diets and may require supplementation when maize is used as the primary grain. The metabolizable energy content of pearl millet is slightly lower than that of maize. However, the higher fat content in pearl millet (5-7% compared to maize's 3-4%) can compensate for this, providing a balanced energy supply in poultry diets (Ravindran, 2013). Further it has been found that pearl millet has higher concentration of omega-3 fatty acid compared to maize therefore, feeding Pearl millet can improve overall health of the poultry. In addition, when comparing the digestibility among the essential amino acids, the following were found to have higher digestibility in pearl millet than corn: arginine, threonine, valine, isoleucine, and leucine.

Pearl millet is rich in essential minerals such as Iron, Zinc, Calcium, Phosphorous, Magnesium and Potassium. Furthermore, pearl millet, with its high fiber content, helps slow down the movement of food from the stomach to the intestines. This leads to longer food interval durations, which in turn prevents obesity. Apart from the nutritional benefits pearl millet is highly drought tolerant crop and can be grown in arid and semi-arid regions where maize cultivation might not be feasible. With a strong rooting system and efficient use of available moisture, pearl

millet can survive in areas with as little as 300 mm or less seasonal rainfall. This compares with a minimum water requirement of 400mm for sorghum and 500-600mm for maize. This makes it a reliable crop for poultry producers in regions prone to water scarcity and erratic rainfall.

Previous research on use of pearl millet in poultry feed

Accurate knowledge of the actual nutritional value of individual feed ingredients is critical for efficient and sustainable poultry production. Several in vivo and in vitro experiments have been conducted in past to explore the effects of replacing traditional feed ingredients such as maize and soybean with pearl millet on poultry productivity. In vivo experiments have demonstrated that replacing maize with pearl millet in poultry feed can yield positive outcomes in terms of nutrient utilization and bird performance. It is also reported by many researchers that the eggs from hens fed the pearl millet-based diets were higher in omega-3 and lower in omega-6 fatty acids than those from hens fed a corn-based diet and can be sold at a higher price.

Future Strategies

Incorporating pearl millet into poultry feed formulations offers a promising avenue for reducing dependency on maize and enhancing the sustainability and resilience of the poultry industry. With proper research, formulation, and support, pearl millet can become a viable alternative that benefits both poultry producers and the broader agricultural ecosystem. Developing a pearl millet variety tailored

for poultry feed requires selecting and breeding for traits that enhance nutritional value, palatability, and digestibility.

Key objectives in this project would likely include:

Identifying Desirable Traits: Focus on high protein content, favorable amino acid profile (especially methionine and lysine), lower anti-nutritional factors (like phytate), and improved starch digestibility, as these are critical for poultry nutrition.

Germplasm Screening: Screen diverse pearl millet germplasm for these nutritional and agronomic traits. Screening efforts could involve collaborations with institutes that maintain large germplasm collections, like ICRISAT.

Trait Selection: Develop a selection protocol to identify and advance genotypes with the desired nutritional traits. This can involve biochemical assays, near-infrared spectroscopy (NIR) for rapid nutrient analysis, and genetic markers if available.

Breeding Strategy: Choose a breeding strategy like recurrent selection or hybridization to combine high-nutrient traits. By using recurrent selection, for example concentration of favorable alleles for poultry feed traits over successive generations can be achieved.

Field Trials and Poultry Feeding Trials: Conduct field trials to ensure good agronomic performance and adaptability. For poultry-specific varieties, feeding trials would be essential to confirm the variety's suitability in terms of growth performance, feed conversion ratio, and overall poultry health.
