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# Developement of poultry feed suplements for enhancing the productivity and perfoamance

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## ABSTRACT

***The demand for protein source for humans in the form of chicken has increased. Egg consumption has been recommended every day. So, people much depend on poultry food throughout the world. As per FAO (Food and Agricultural Organization) published data, meat production of 109,970 thousand metric tons in 2014 raised to 111,000 thousand metric tons in 2015 which is a 3% lower annual growth rate compared to the past 10 years. Poultry diets were formulated based on the nutrient requirements and their metabolism, checking the availability of nutrients from the feed ingredients, where cost-effective. In developing countries, the unavailability of accustomed feedstuffs, and Increase in the cost of the available feedstuffs were stopping the poultry productivity and it will be more in the future. So, this type of condition demands the immediate requirement of alternative feedstuffs that are used in a wide range. To increase the poultry productivity, performance and healthy flocks, feed supplementations or additives are required instead of the daily feed uptake. Feed supplements provide constant energy, essential amino acids, proteins, vitamins and minerals mixed with water or feed. Major feed additives include Enzymes, Antibiotics, Coccidiostats, pigments, Antioxidants, Antifungals, etc.***

***Keywords***— *Probiotics, Chicks, Feed supplements*

## 1. INTRODUCTION

The Largest poultry meat production currently is from the United States, China, European Union, and Brazil. As per FAO 2015 published data, it was expected that by 2024 the estimated meat production (x 1000 metric tons) of India will be 3521, metric tons which are very less compared to (US 24,424), China (23,112), Brazil (15,702). As per FAO, Egg production (x 1000 metric tons), India stands in the third position with 3835 metric tons which were less compared to the USA standing in the second position with 5636 metric tons and China at first position with 28,761metric tons.

To reduce the chances of infections in poultry and subsequent contamination of poultry products, Probiotics opted as one of the approaches. For many centuries probiotics were consumed as a nutritional component of foods. Probiotics, acclaimed as a safe growth promoter in animals using as a feed additive (O'Dea *et al*. 2006; Sabatkova*et al*., 2008; Bansal, *et al.*, 2011). The most extensively used probiotics in humans included *Lactobacillus and Bifidobacterium. Enterococcus* and *Saccharomyces* cultures were used as live stocks (Simon *et al*., 2001). However, there has been an increasing trend on the feeding of *Lactobacillus* to livestock (Gusils*et al*., 1999b; Jin*et al.*, 2000; Tellez *et al*., 2001; Kawakami, *et al*., 2011)

As feed additive, probiotics showed a good impact on the poultry performance (Stavric and Kornegay, 1995; Ananda kumar and Lakshmi Narayan, 1997; Patterson and Burkholder, 2003; Dhama and Singh, 2016; Hajati and Rezaei, 2010) and this helps to improve egg production, weight and size (Nahashon *et al.*, 1992; Jin*et al.*, 1998; Han *et al.*, 1999; Park *et al*., 2001, 2002; Kim *et al.*, 2002; Shivani *et al*., (Ananda Kumar and Lakshmi Narayan, 1997; Jin*et al*., 1997; Fuller, 1989; Rolfe, 2000; Patterson and Burkholder, 2003; Boirivant and Strober, 2007; Ng *et al*., 2009; Dhama and Singh, 2010; Hajati and Rezaei, 2010). Explained the pathogens reduction by probiotics usages and immune stimulation and also reduction of ammonia production. From (Higgins *et al*., 2007; Vicente *et al.*, 2007a; 2007b; Bansal, *et al*., 2011) proved that development of normal, microflora done by probiotics.

## 2. MECHANISMS OF ACTION

The mode of action of probiotics in poultry includes:

- Maintaining normal intestinal microflora by competitive exclusion and antagonism
- Altering metabolism by increasing digestive enzyme activity and decreasing bacterial enzyme activity and ammonia production
- Improving feed intake and digestion

 

- Stimulating the immune system.
- To control endemic and zoonotic agents in poultry probiotics and competitive exclusions have been used.

The experiment process attempted to control a severe outbreak of *S. infants* in Finish broiler flocks by Nurmi and Rantala. In their study, it was determined that very low challenge doses of *Salmonella* (1 to 10 cells into the crop) were sufficient to initiate salmonellosis in chicken. Probiotic microorganisms were considered to support the host health. However, the support mechanisms had not been explained. (Holzapfel *et al*., 1998) They studied how probiotics work, and the mechanisms from these studies were tried to explain how probiotics could protect the host from intestinal disorders. (Rolfe 2000, Çakır 2003, Salminen *et al*., 1999, Castagliuola *et al.,* 1999).

**2.2 Probiotics on Growth Performance**

The use of probiotics as a feed additives to the chicks showed many applications including improved growth performance, increase in feed conversion efficiency and improved immune responses (Guillot, 2000; Balevi*et al.,* 2001; Brashears*et al.,* 2003; Mountzouris*et al*., 2007; Rowghani*et al.,* 2007; Awad *et al*., 2009; Saadia *et al*2010; Bansal *et al.,* 2011). (O'Dea *et al*., 2006) The effect of probiotics on the production efficiency of broiler chickens Huang *et al.* (2004) said that inactivated probiotics also showed beneficial effects on live stocks to increase the growth performance and immune response in broiler chickens.

*L. sporogenous* (100 mg/kg feed) result in increased body weight and improved FCR in commercial broilers as proved by Panda *et al.* (2003). In another study, using the addition of probiotics *(L. acidophilus and S. faecium*) to broiler feed significantly improved the growth rate (Mohan *et al.,* 1996; Choudhary *et al.,* 2008*). S. cerevisiae* in live form along with *L. acidophilus* and *S. faecium* were supplemented in broiler feed (1 kg/ton) and the results showed an improved weight gain and FCR (Choudhary *et al*., 2008) Lactobacilli spp. Supplementation resulted in an improvement in feed efficiency and egg production (Mohan *et al*., 1996) in layers. Balevi*et al.* (2001) Experiments on (Protexin™) probiotic reported that resulted in improved feed intake,body weight gain and FCR.

Yoruk *et al.* 2004 reported that feed conversion rate was improved linearly with increasing level (0.1% and 0.2%) of probiotics (*Lactobacilli spp. + Enterococcus faecium+ Bifidobacteriumbifidum + Aspergillus Oryza*) in hens during the late laying period. Eckert *et al.* (2010) reported that body weight and FCR were improved in response to Lactobacillus-based probiotics. Similarly, Zhu *et al.* (2009) reported that *Lactobacillus salivarius* improved body weight gain and FCR.

**2.2 Probiotic effect on The Intestinal Microbiota And Intestinal Morphology**

Gut microflora of chicks shows a major role when replaced with beneficial bacteria. Particularly, in the case of newly hatched chicks, the gut is sterile and shows acquiring microflora from the environment. So pathogenic microbes may multiply faster than the beneficial bacteria, chicks may get infected at this time. Post hatched chicks were able to stabilize the microflora and maintained the balance between the 'favorable' and 'harmful' organisms. Probiotics supplementation emerged that to reduce the infectious pressure or internal factors like stress, stress, and infectious environment was developed by surrounded microbes.The concept of maintained a balance between these two gets affected or influenced by the Successful colonization of probiotics .probiotics depends on the survival and stability of the microbial strain used and their relationship with the host, dose and usage frequency, and host health, nutritional status, age, stress and genetics (Mason ***et al***., 2005). The population ranging from $10^4$ to $10^8$ CFU/ ml (*Lactobacilli, Streptococci, and Enterobacteria*) (Gaskins, 2003) in the small intestine. The highest bacterial population, accounting for $10^{10}$ to $10^{13}$ CFU/ml, had been recorded in the colon and caecum, (Heczko***et al***., 2000)

**2.3 Improving Digestion, Nutrient Metabolism and Utilisation of Nutrients**

By the production of lactic acid and decreased gut pH Probiotics helped to the utilization of nutrients by offered the digestible proteins, vitamins, enzymes,and other important co-factors improved digestion, nutrient metabolism.As 'live enzyme factory' (amylase, protease, lipase) enhanced digestion and absorption of carbohydrates, proteins,and fats, which also increased the feed conversion efficiency. Probiotics helped in the metabolism of minerals and synthesized vitamins (Biotin, Vitamin-B1,B2, B12, and K), which were responsible for proper growth and metabolism (Dhamaand Singh, 2010). Yeast has released the enzymes toincreased the digestibility of dry matter. (Jonvel, 1993; Lee *et al*., 2006)(Pal andChander, 1999; Vegad, 2004).Regular usage of probiotics was caused healthy and balanced microflora and suitable for microflora of beneficial and not suitable for pathogens by the colonization of probiotics on intestinal microflora by competitive exclusion.by the production of antimicrobial substances, like bacteriocins,lactocin,lactic acid, hydrogen peroxide, and lactoperoxidase inhibited pathogenic microbes, pathogenic bacteria released the enterotoxins were neutralized by probiotics.Like that mycotoxins presented in feed bounded by probiotics were not done by pathogens

**2.4 Stimulation of Immunity**

The microflora of the gut plays an important role in boosting the immune system (Diarra *et al*., 2011). Intestine bacteria primarily contacted with the cells of the gut-associated immune system (Haghighi *et al*., 2005). The promotion of the activities of splenic NK cells and stimulated the phagocytic activity done by the oral administration of probiotics (Matsuzaki *et al*., 1998). By improved the immune status by oral dose with native gut flora from salmonella-free adult birds was protect chickens. (Starvic, 1987)and Panda *et al.* (2008).In laying hens humoral response was increased by the formulation of *L. sporogenes*is 100mg ($6 \times 10^8$ spores) per kg. By the increased the activities of antibody-producing cells, which might have been stimulated by the probiotic organism significantly higher antibody titers and Coetaneous Basophilic Hypersensitivity (CBH) in layers supplemented with probiotics (100 mg/kg of feed) by Panda *et al.* (2003).

 

An indication of stimulated the mucosal immune system, which secreted immunoglobulin (IgA) in response to antigenic stimuli (Nahashon*et al*., 1994) done by supplementation of probiotics in layers increased cellularity of Payer's patches in the ileum, High significantly more serum antibody (IGM) against SRBC (Sheep Red Blood Cells) Probiotic-treated birds have than birds that were not treated with probiotics (Haghighi *et al.*, 2005*). L.acidophilus* and *L. casei* in inactivated form enhance IgA titers in the serum of broiler chicks (Huang *et al*. 2004). Li *et al*. (2009). Higgins *et al*. (2007) stated that improved the number of macrophages in the caecum as well as increased the phagocytic activities against *Salmonella enteritidis*,

**2.5 Evaluating Probiotic Effects on Meat Quality**

Mahajan *et al.* reported that meat from the probiotic-treated group showed the highest CFU/g than control. On the other hand, Zhang *et al.* Experiment showed that 240, day-old, male broilers to investigate the effects of *Saccharomyces cerevisiae* (SC) cell components on the meat quality and they reported that meat tenderness could be improved by the whole yeast (WY) or *Saccharomycescerevisiae*extract (YE). Kabir et al. reported that probiotics affect the microbiological quality of dressed broiler meat and sensory characteristics and proved that meat quality at pre-freezing and post freezing storage. Mahajan *et al*.attributed the meatballs appearance, texture, juicinessLodiet al. [109] stated that neither probiotic nor antibiotics affected sensory characteristics (intensity of aroma, strange aroma, flavor, strange flavor, juiciness,tenderness, acceptability, characteristic color, and overall aspects) of breast and leg meats.

**2.6 Egg Production and Egg Quality**

Probiotics were increased egg production, and improved egg quality and decreased egg contamination in layers (Panda *et al*., 2003). Balevi *et al.* (2001) and Nahashon *et al*. (1994) found that a greater shell thickness following by probiotic supplementation Nahashon *et al*., 1994; Panda *et al*., 2008). Variations in the effect of probiotics obtained from various studied that the difference in strains, a form of bacteria yeast and fungi, with a different concentration in the diet and viability in the gastrointestinal tract (Panda *et al*. 2008). (O'Dea *et al*., 2006). (Protexin™) supplemented diets resulted in a decreased broken egg ratio in layers (Haddadin *et al.*, 1996; Kurtoglu*et al.*, 2004; Van Immerseel *et al*., 2006). Hassanein and Soliman (2010) reported that live yeast culture of Saccharomyces cerevisiae at the level of 0.4% and 0.8% resulted in a significant increase in egg production, egg albumin, egg yolk and eggshell thickness in White Leghornlayers York*et al*. (2004) found that egg production increased linearly with increased the levels of probiotics (*Lactobacilli spp. + Enterococcus faecium )*

*Bifadobacteriumbifidum + Aspergillus Oryza*) during the late laying period in layers. Panda *et al*. (2003) reported that no improvement in FCR, Panda *et al*. (2008) reported that dietary preparation of *L. sporogenes*is 100 mg (6 × 108 spores) per kg of diet significantly increased egg production, eggshell breaking strength, shell weight and shell thickness inlaying hens. (Balevi*et al*., 2001; with Lactobacillus-based probiotics in Single Comb White Leghorn layers.

## 3. CONCLUSION

In past years, men considered that all bacteria as harmful, forgotten about the use of the organisms in food preparation and preservation, thus make the probiotic concept somewhat difficulted to accept. The concept of probiotics in a recent year was no more confused was earlier though. It now constitutes an important aspect of applied biotechnological research and therefore as opposed to antibiotics and chemotherapeutic agents were employed for growth promotion in poultry Scientists were triggered effort to establish the delicate symbiotic relationship of poultry with their bacteria, especially in the digestive tract, where they were very important to the well being of man and poultry. The present review revealed that probiotics applications as a nutritional tool in poultry feeds for enhancement of promotion of growth, of intestinal microflora modulation and pathogen inhibition, immunomodulation and promoting meat quality and improved the egg quality of production of poultry.

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