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Role of Probiotics in Poultry Production

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ABSTRACT

Chicken has the highest population among food animals all over the world. It is reared on farms all over the world being cheap in price as compared to other food animals. However, the usage of antibiotic growth promoters has resulted in the reduction of resistance against pathogens. As a result, the farmers were facing losses. The European Union banned the usage of antimicrobials and probiotics have taken the place of antimicrobials. Probiotics are the live microbes that when added to feed help the animal fights against pathogens by either releasing substances or by enhancing the immune response. The advantages of using the probiotics-added feed cannot be denied as they increase the production, performance, product quality, strength of the bones, immune response, size of the gastrointestinal tract, and the number of intestinal villi.

Introduction

Chicken is reared worldwide among all food animals due to its highest population among all animals that are reared for food purposes. Antibiotics have been widely used in the diet of chicken at a sub-therapeutic level as a growth promoter (1). Antibiotics kill the species of bacteria that are susceptible. While the resistant strains continue to grow in numbers. The resistant strains of the bacteria may also transfer the resistant genes to other bacteria as well (2). For example, *P. aeruginosa* has been found to be 100% resistant to many antibiotics including cephalosporins, ciprofloxacin, colistin, and erythromycin in Pakistan (3). Due to the negative effects of Abs (antibiotics), they have been banned by the European Union (EU). Due to these causes, nutritionists along with pharmacists have come up with replacements for antibiotics that are safe for animals as well as humans. One of the replacements includes probiotics (4).

Probiotics

Probiotic was derived from the Greek words "pro" and "bios" meaning "for" and "life" respectively (5). F.A.O (Food and Agriculture Organization) and W.H.O (World Health Organization) define probiotics as "living microorganisms which benefit the host health when given in adequate quantity" (6). A Probiotic is "a live microbes-based feed ingredient that enhances the equilibrium of the intestine and benefits the host animal" (7).

Mode of Action

Mainly Lactobacillus, Bacillus, Saccharomyces, Enterococcus, and Bifidobacterium species are used as probiotics for poultry. These bacteria produce substances that include acetic acid, lactic acid, and propionic acid which are short-chain organic acids. Bacteriocins like acididonila, reutryna, acidofilina, lacocydyna are also produced which have very efficient antibacterial activity against *S. aureus, C. perfringens, E. coli* and *Campylobacter*. Hydrogen peroxide is another substance that is produced by these probiotics. By producing these substances, the probiotics compete with the pathogenic bacteria and as a result, they benefit the host by preventing diseases. The ability of the probiotic to adhere to the intestinal mucosa provides a natural barrier against the pathogenic bacteria and thus it enhances the immunity of the host animal. Moreover, the immune system efficiency is also stimulated by the probiotics (8) (9) (10).

Characteristics of Probiotics

Probiotics should be of host origin which means that they should be from the microflora of the animal which is its target. Probiotics should be non-pathogenic and should not cause disease in the host. It should adhere to the intestinal mucosa and it should have the ability to persist in the intestines. It should produce the substances required to compete with the pathogenic bacteria. It should withstand and resist processing. The activity of the probiotics should not be altered by the gastric acid (11). According to the F.A.O (Food and Agriculture Organization), probiotics should provide health benefits to the host such as vitamins, and essential amino acids production. Other benefits like antitumor activity and food protection from pathogenic bacteria (12).

Using Probiotics as Prophylactic:

Usually, Probiotics are used as feed ingredients to balance the gut bacteria and to enhance the health of the animals. By using non-pathogenic bacteria (either single or multiple) or yeast, the growth of the pathogenic bacteria is inhibited in the gut of animals. By this, the overall performance of the bird is enhanced, and the chances of intestinal illness are reduced (13). Probiotics boost human defense, and the chances of necrotic enteritis are reduced. Moreover, probiotics stop the growth of pathogenic bacteria by producing specific antibacterial substances (14).

Advantages of Using Probiotics in Poultry Production

1. Alternative to Antibiotic Growth Promoter

"Immunity depends upon the health of the intestine" is a statement that has become much popular in the poultry industry after probiotics emerged. Probiotics are used in place of Antibiotic growth promoters (A.G.P) as they have been banned due to their negative effects (15). Probiotics are now the alternative growth promoters and they increase the productivity of the animals as well as the product quality (16).

2. Effect on the Internal Organs

Probiotics may result in an increase in the weight of a few organs. Many authors from their study found the increase in the masses of a few organs (thymus, spleen) as significant (17,18). The most important part to find out the effectiveness of the probiotics is the gut. Increasing the density of villi of the intestines as well as the crypts results in an increase in the absorption of nutrients. It also increases the colonization of the bacteria (19). The length of the bowel has also been found to increase (20). The increase in the number of Peyer's patches that are found in the mucosa and submucosa has also been found which play an important function in the immune response of the body and help in fighting against pathogens. (21 22)

3. Strengthening the Bones

A diet with probiotics added tends to increase the strength of the bones by increasing the retention of calcium and phosphorus. This was observed by the bone mineralization improvement and increase in the serum level of these elements (23). Probiotics tend to reduce the pathologies or diseases associated with bones which include bone resorption as well (24). Improvement in the walking of the birds suffering from bacterial chondro-necrosis has been observed. The incidence of lameness was low in broilers that were fed with probiotic-added feed (25).

4. Enhancing the Production during Heat Stress

Heat stress can be defined as "an increase in the humidity and temperature above an acceptable level which makes the thermal regulation difficult (26). Adding of probiotics has resulted in the enhancement of the laying in the chickens. (27)

Future Prospects

After the regulations by the European Union, there has been a significant modification in the feeding standards of the animals. Due to the adverse effects of antibiotic growth promoters (AGP), they have been replaced by probiotics. The awareness of the consumers has made the breeders quit the usage of the antimicrobials. A lot of research is yet to be done on probiotics. However, the future of probiotics in poultry production appears to be strong.

Conclusion

Poultry farming was facing a lot of challenges due to the development of the resistance by the microbes against the antimicrobials. However, probiotics have now replaced antimicrobials. Probiotics are the feed additives that help the chicken fight pathogenic bacteria. Moreover, they

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result in increased production and better performance. Using probiotics, the expansion of the pathogens can be reduced. However, if you want to get rid of all the pathogens then it is not a suitable option

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