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# A Review on the Role of Fiber in Poultry Nutrition

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**Abstract**

The role of fiber in poultry nutrition has become a subject of concern to many poultry nutritionists. Experiments conducted had generated conflicting results. While some believe that crude fiber (CF) is an integral component of poultry diet, others argue that its inclusion in poultry feed is not necessary as it produces devastating results. Some beneficial results obtained from fiber inclusion in poultry diet showed that dietary fiber stimulate paristalsis, serve as source of mineral, vitamins, probiotics, unidentified growth factor, maintain the normal structure and function of the intestinal mucosa, reduce feed cost while maintaining a balance of nutrients, reduce excess fat deposition, blood sugar, cholesterol, feather pecking. It is important to note that the devastating results reported by some researchers can be completely eliminated if the type, handling, processing and enzyme supplementation of fiber in poultry diets are adequately planned to suit the requirement of the specified age and class of bird to be fed. With this strategy, feedstuffs that are high in fiber can be used to conveniently replace 60—100% of the conventional energy sources in poultry feed.

**Key words : Dietary fiber, Poultry feed, Birds, Performance.**

The high cost of feed due to high cost of conventional feed ingredients had compelled most poultry farmers in developing countries to compound their own feed using agro-industrial wastes (AIW). In countries like Nigeria, where there is abundant AIW causing pollution, the use of such feed ingredient is a welcomed development as it greatly reduces the cost of poultry production while at the same time control environmental pollution. The use of these AIW is presently making fiber an integral component of poultry feed as they are known to contain substantial amount of fiber in addition to some vital nutrients like protein, energy, vitamins and minerals. Examples of these AIW are palm kernel cake, wheat bran, rice offal, brewers dried grain, maize offal, groundnut pods, cassava peel, maize cob, yam peel, cocoa by-products, sunflower cake.

Fiber is primarily made up of lignin and non-starch polysaccharides (NSP). Hetland et al. (1) classified fiber according to water solubility, the insoluble fiber such as cellulose, NSP and lignin and the partly soluble fiber such as arbinoxlans, B-glucans and pectins. The place of fiber, in poultry diets has been a subject of concern among poultry nutritionists. According to Albanese (2), the fiber content of feedstuff is probably the most single and most important determinant of the nutritive value of the feed. This is because fiber largely determines the proportion of chemically available nutrients which can be utilized by the animal. He further stated that microbes present in the caecum of monogastric animals can sometimes affect little breakdown of cellulose. Interestingly, recent breakthrough in biotechnology and animal nutrition has revealed that exogenous enzyme supplementation renders NSP digestible.

## *Benefits of Fiber in Poultry Diet*

Several research findings indicated that dietary fiber has some beneficial effects in both non-ruminants and man. Crude fiber (CF) is bulky and therefore it is used in the deliberate dilution of feed to reduce excess fat deposition in animals (3, 4) and to reduce blood sugar and cholesterol (4, 5). Amodu

(6) reported that fiber aids digestion because its bulk stimulates paristalsis and secretion. He further stated that poultry can digest 10—20% fiber in diet. Fibers are sources of minerals, vitamins, probiotics and unidentified growth factors (5—7), while Mendeloff (8) reported that plant fiber might play a role in counteracting the toxic effect of drugs, chemicals and feed additives. According to Ojewola et al. (9), CF plays an important role in the maintenance of the normal structure and function of the intestinal mucosa. It could be used to increase feed intake by feed dilution to lower dietary energy in period of high temperature and heat stress (10). They also reported that birds fed high fiber diets spend more time eating and appeared quieter than those fed low fiber diets. This confirmed earlier report (3), that birds' behavior can be positively enhanced by increased dietary fiber. Hetland and Svinus (11) stated that birds require coarse fiber in their diet probably for gizzard activity. But Van-Krimpen (12) found that chicks prefer not just fiber but coarse fiber to satisfy their foraging habits. They further stated that feather pecking can be controlled nutritionally by manipulation of diets through the use of fiber. Birds with low energy density diet (dilution with fiber), would increase feed intake and eating time, thus, reducing feather pecking and cannibalism (13, 14).

### *Disadvantages of Fiber in Poultry Diet*

Despite the beneficial effects of fiber in livestock feed, some research findings indicate that fiber is detrimental in diets of poultry. Ershoff (15) stated that both copper and zinc were bound by fiber sources during *in-vivo* studies. They believed that certain types of dietary fiber are particularly responsible for lowering zinc, calcium, phosphorus and probably iron absorption. Cunha (16) stated that fiber intake may mean low intake of feed nutrients unless the roughage is fortified with these nutrients, while Khattak (17) reported that CF entraps nutrient in insoluble complex which forms in the cell wall of plants thereby resisting digestion by the endogenous enzymes in the gastrointestinal tract of poultry and other non-ruminant animals. Similarly, CF was im plicated as the factor depressing nutrient digestibility, absorption, availability and utilization (5, 18, 19). Lilie and Denton (20) showed that growing chickens on high fiber diet exhibited a delay in sexual maturity with reduced body weight, while Kondra et al. (21) recorded significant reduction in feed consumption and body weight gain when meat and egg type chickens were fed with high fiber diet (19.6%) during the last 6 weeks of their growing period. The liver size of quail decreased when fed on high fiber diet (22) while Starck and Rahmaan (23) noted significant increase in gizzard size, intestine length, mucosal surface, thickness of the intestinal muscular layer and vascularization of the mucosa when quails were switched from standard diet to high fiber diet and a decrease in all these parameters when their diet was switched back to standard diet. Studies on phenotypic flexibility of avian digestive system had shown that intestine size and function respond to a variety of nutritional factors and to changes in internal demands (24—27).

To enhance the utilization of fiber by monogastric animals, many strategies are currently employed. These include the following. Use of enzymes : Enzymes aid the digestion of fiber thus improving the utilization of the diet. They also have positive impact on the environment through reduced output of excreta and pollutants such as phosphate and nitrogen. Use of additives : Feed additives help to enhance the micro-environment within the digestive tract. This facilitates feed digestion, including the fiber component of the feed. Particle size reduction and feed pelleting : Particle size reduction improves the digestion of nutrients by increasing the surface area available to digestive enzymes. The heat involved in the process of pelleting assist in breaking down the fiber particles for easy digestion by poultry birds. Choice of fiber : The age and class of birds determine the type of fiber to be included in the diet of the bird. Wheat offal for instance, cannot be utilized effectively by broilers and pullet chicks but can be utilized to some extent by growing pullets and cockrels.

### *Conclusion*

In view of the numerous benefits reported by various researchers, the disadvantages recorded by some, can be completely eliminated if the type, handling, processing and enzyme supplementation of fiber in poultry feed are adequately planned to suit

the requirement of the specified age and class of birds to be fed. With this strategy, feed ingredients that are high in fiber can be used conveniently to replace 60—100% of the conventional energy sources in poultry feed.

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