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Efficacy & Significance of Bio Choline as Choline Source in Poultry

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Abstract

Choline chloride, an organic, colorless, alkaline substance that is treated as a vitamin, though not a vitamin of B complex category, due to its multifaceted functions in animal husbandry too. Specifically, in Poultry where it seems to be the prime reason for hepatic health, apart from its role in the various metabolic and physiological activities. The economic importance of Choline in Poultry has led to the stocking up of innumerable number of its Synthetic forms in the market. These are hygroscopic, corrosive, offensive, off-flavored, non eco-friendly and in being inferior quality and working wise. This has led to an effort and search for alternatives, leading to Phytogenic Herbals as ideal sources. The Bio choline from Indigenous Indian herbs like Azardarictha, Achyranthes, Andrographis, Allium sativum, Fumaria, Solanum, Silibum, and Tachyspermum, was non hygroscopic, non-corrosive, non-off flavored and ecofriendly. The Bio choline equivalence of these herbs was as Phosphotidylcholine with a capability of replacing Synthetic choline completely with good quality and excellent working.

Keywords: *Bio Choline; Fatty Liver; Herbs-Phosphotidyl Choline; Poultry; Synthetic Choline.*

1. Introduction

Choline chloride, ((CH3)3N(Cl)CH2CH2OH IUPAC name 2-hydroxyethyl (trimethyl) azanium chloride) is an organic, thick, colorless, strongly alkaline substance which is known to be an essential vitamin, though not a vitamin under the B-complex category.Choline the recently discovered, an essential vital nutrient, an essential dietary amine required for the normal bodily function and health of the animal affecting almost all of them. Channelizing all its importance under three main genres: in the transmethylation pathways it serves as a methyl donor, as the precursor of acetylcholine performs its role in the transmission of nerve impulses, as the structural constituent of phospholipid has its role in the emulsification and transport of lipids and also in the maintenance of the cell membrane [1].

- Betaine, is the oxidized form of choline, that aids as a methyl donor.
- Acetylcholine, the acetylated form of choline is the neurotransmitter
- Phosphatidylcholine, is the phosphorylated form that is the structural component of the cell membrane and also important in the lipid metabolism.

Normally Choline chloride is available in 4 concentrations in the market each specific to specific animal

- **Choline Chloride 50%**: This is the most common of Choline Chloride and This yellowish, fishy odoured, water soluable form is used primarily in poultry feed.
- **Choline Chloride 60% & 75 %**: This white, crystalline water soluable powder most common in swine and 75% in livestock feed.
- **Choline Chloride 70%**: Primarily as premix and supplement in animal feeds. White crystalline water soluable powder.
- Based on origin Choline Chloride is of two types: synthetic and natural.
- **Synthetic Choline Chloride**: Used in animal feed for its easier availability and lesser cost, obtained by chemically synthesizing as choline bitartarate made using ethylene , ammonia with hydrochloric acid. It is not bound to Phosphate hence is less bioavailable, hygroscopic and more corrosive. Produces toxic Tri Methyl Amine in the gut as its end product of its biochemical reactions and leads to oxidative loss of vitamins

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in the diet.

- **Natural Choline Chloride**: It is derived from natural sources is more bioavailable, non-hygroscopic, and less corrosive, does not form the toxic tri methyl amine in the gut, it is combined with the phosphate and apart from all these has an array of health [2].

1.1. Characteristics of Choline Chloride

Choline Chloride, an essential amine, a quaternary ammonium salt with choline cation and chloride anion, as an important water-soluable nutrient, precursor of acetyl choline and methyl donar. Choline is an organic, water-soluble compound, neither a vitamin nor a mineral, however often grouped with the vitamin B complex due to its similarities.

1.2. Choline Chloride's Importance

The importance of Choline chloride lies in the maintenance of the cell membrane structure and its signaling mechanisms, in the transmission of nerve impulses, in the production of acetylcholine the neuro transmitter, in lipid metabolism, as a liver protectant and stimulant, influencing the growth, metabolism and development of the organism. It includes the platelet-activating factor acetylcholine , plasmalogens, lysophosphatidylcholine and betaine. A basic constituent of lecithin that is found in many plants and animal organs, important as a methyl donor and in lipid metabolism.Functions as a Lipotropic agent preventing the abnormal in filteration of fat in liver leading to the fatty liver syndrome. Helps in the formation of excitatory neurotransmitter Acetylcholine crucial for the proper functioning of the nervous system. It is an important Methyl group.As Phospholipid for the cartilage matrix and its maturation. Choline is needed in the production of lipids and its transport, responsible for the structural integrity and formation of cell membranes and also essential for the removal of excessive fat and cholesterol from the liver. Has its role in DNA synthesis. Very important for the formation of a Phospholipid Lecithin, a component of egg yolk.

1.3. Significance & Unique Features of Bio Choline

The synthetic form of Choline is the inorganic form that is scantily absorbed from the Gastrointestinal tract making it less bioavailable. It has a fishy odour, is corrosive, hygroscopic and releases Tri Methyl Amine as its metabolic end product in the gut. This enhances the oxidative destruction of vitamins mainly. Hence the role of stable herbal additives that are rich in Biocholine as phosphatidylcholine may be the only safe alternative source of choline.

1.4. Unique Features of Herbal Choline/ Biocholine

Non-hygroscopic, so no damage to other vitamins/minerals. Non-corrosive so does not cause damage to premix/feed. Does not produce toxic Tri Methyl Amine. Direct action – no intermediate steps – supplies Phosphatidylcholine, phospholipids and PUFAs. Better results at lower inclusion costs – better margin for pre mixer/feed manufacturer/farm more Bioequivalence. The roles of Biocholine can be broadly categorized as Structural and Functional. The building and maintaining of cell structure, and formation of acetylcholine are treated as structural roles. While the lipid metabolism and that of being a methyl group donor come under the functional role [3].

1.5. Choline Deficiency Effects

Choline deficiency is mainly observed by the histological evidence of fatty liver, which is again due to the lack of phosphatidylcholine, this in its turn restricts the expulsion of excess triacylglycerols from the liver, accompanied with muscle cell damage which is signaled by elevated creatine phosphokinase activity in serum, all these are chain reactions. Fatty Liver Syndrome is observed more in animals kept on high energy diets, in confined areas, since they do not get sufficient opportunity for free movement and exercise. Fatty Liver is also associated with deficiency of methyl group donors, increased liponeogenesis due to deficiency of Vitamin-B Complex, reverse mobilization of fat due to stress condition, high mycotoxins etc.An efficient choline transport system present is capable of pumping choline against a concentration gradient, enabling depletion of choline with an effort to maintain adequate choline in the body. This in its turn prevents perosis. This is affected by the deficiency or absence of Choline.

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1.6. BioEquivalence of Bio Choline and Synthetic Choline

The synthetic choline in the form of chloride gets transformed to trimethylamine by the intestinal bacteria and immediately excreted out. While there is no or low degradation of phosphatidylcholine in the gastrointestinal tract and an indirect effect of the lipid metabolism.

Biocholine enhances flow of bile juice, improvement of body weight, effective carbohydrate and lipid metabolism, better FCR, improve energy utilization, no fatty liver etc.,.Bio Choline is produced from selected plants that contain high content of choline with improved bioavailability and reduces conversion of choline to TMA. Bio Choline also contains glycerols, phosphatidyl inositol and phosphatidyl serine which play significant role in metabolism, enzymatic modulation and biosynthesis of phosphatidylcholine.Along with PUFA(s) and phospholipids, optimize lipid metabolism[4].

2. Studies on BioCholine in Poultry

The Comparative study on the effects of synthetic choline and herbal choline on layers and broiler chickens conducted to determine comparative effects of synthetic choline and herbal sources of choline on hepatic lipid metabolism, egg laying and other growth characteristics. Randomly selected birds were divided into 3 groups, control, Ts- Birdsd fed with synthetic choline, Tb – Birds were fed with Biocholine CHOLI HERB for about 2 weeks.

The poultry birds are incapable of synthesizing choline, this prevents Perosis, prevents liver enlargement and fatty liver syndrome in the bird needs to be fulfilled only by supplementation only, hence is more so important. After 2 weeks of feeding it could be concluded that only the herbal supplements successfully replaced their synthetic analogues from the broiler ration. In layers, it is seen to enhance maximum egg production. Since the required Biocholine for the formation of a phospholipid lecithin, a component of egg yolk was provided by the herbal counterpart. Decrease in serum cholesterol, enhanced weight gain and better FCR. Supports its immune system, stimulates the ovaries with more egg.

3. Choli Herb and its Salient Features

Choli herb helps build phospholipids important in cell membrane formation.

Acts as a hepatoprotective transporting excessive fats out of the liver, prevent fatty liver syndrome. Is involved in the production of acetylcholine, a neurotransmitter. Plays an important role in maintaining overall health and well-being of the bird, has shown to improve feed utilization and better returns. Has also shown to improve growth, weight, performance and in the production of phospholipids, which are critical components of egg yolks. Supplementing animal feed with choline Chloride can improve egg production and quality. In poultry, Choline Chloride has been shown to improve egg quality by enhancing eggshell strength, egg weight, and yolk colour.The plants presented the conjugated form of bio choline—with high concentrations of phosphatidylcholine the potential alternative sources to the synthetic choline chloride. The recommended bioequivalence by these studies is one unit of herbal source for every 2 units of choline from chloride.

Plants are the rich source of valuable biochemical and bioactive compounds, the following form the herbal components under discussion here.

3.1. Azardaricta indica

The contribution of choline-related compounds present in this herbal source, such as free choline, glycerophosphocholine, phosphocholine, phosphatidylcholine and sphingomyelin. Contributing to lipid absorption, Reduction of Alkaline Phosphotase (ALP) and Alanine Transaminase (ALT). ALT Transaminase ALT is a hepato-specific enzyme located in the cytoplasm of hepatocytes and is released when there is damage to the cell membranes. Lower total cholesterol, serum triglycerides and enhanced phosphatidylcholine, a phospholipid responsible for exporting triglycerides from the liver to peripheral tissues.

3.2. Achyranthes aspera

The plant, Achyranthes aspera, has high concentrations of phosphatidylcholine, the phyto chemicals present benefit the animal’s health.

3.3. Andrographis paniculata

The final body weight, Growth and FCR (Feed Conversion Ratio show linear improvement by this

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inclusion of bio choline, regulates adipogenesis and lipogenesis, plays an important role in the regulation of fatty acid and glucose metabolism. This Biocholine plant additive product contains choline conjugates resistant to rumen degradation with important hypoglycemic effects.

3.4. Allium sativum

Promotes internal antioxidant activities and reduces the production of oxidizers such as oxygen-free radical species (ORS), protects against --induced hepatotoxicity by improving antioxidant status and regulating oxidative stress also shows high free radical scavenging activity. Involved in the synthesis of Butyrylcholinesterase (BuChE) enzymes (enzymes that break down neurotransmitter choline).

3.5. Fumaria indica

Hepatoprotective potential of Fumaria indica against d-galactosamine induced hepatotoxicity. The isolated protopine proved equally effective hepatoprotectant vivo to an extent, a known antihepatotoxic agent.

3.6. Solanum nigrum

Solanum nigrum contained the highest concentration of phosphatidylcholine, gentisic acid, luteolin, apigenin, kaempferol, and m-coumaric acid as active ingredients along with other vitamins and minerals.

3.7. Silybum marianum

It seems to optimize the flow of bile to the gallbladder, supporting the retention of the liver's physiological purification function, containing choline which contributes to the preservation of a normal liver function contributing to a healthy liver.

3.8. Trachyspermum ammi

Ajwain or Trachyspermum ammi apart from many medicinal compounds also possesses a good quantity of bio available choline and anti calcifying agents.

The plants Trachyspermum ammi, Andrographis paniculata, Achyranthes aspera, Allium sativum, Solanum nigrum, Silybum marianum, Fumaria indica and Azadirachta indica present the conjugated form of choline—with high concentrations of phosphatidylcholine—and is the potential alternative source to the Synthetic Choline Chloride showing a hydrolyzed neurotransmitting acetylcholine. This biocholine enters the biological cycles as methyl group donors, this helps in control of fatty liver. It conjugates and promotes expression of hepatic genes, that regulate lipid metabolism. Very helpful in neutralizing the adverse effects of metabolic effects of high energy feeds[5].

Choli herb, the natural Choline has the bio equivalence as phosphotidylcholine that can replace synthetic choline, cent percent. It's synergestic activity works on the physiology and metabolism of liver, ensuring the maximum bioavailability of the herbal choline, in regulating lipid and energy metabolism, improved FCR, weight gain, laying performance and improved egg production, no Tri Methyl Amine produced, precursor of acetylcholine the neurotransmitter, natural, hazard free. It prevents fatty liver kidney syndrome and lameness conditions in birds. Action of Choli Herb in Poultry image is shown in Figure 1.

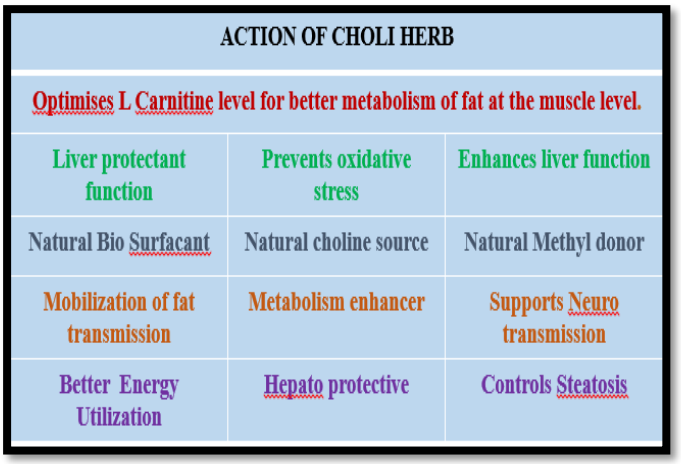

Figure 1 Action of Choli Herb in Poultry

4. Results and Discussion

The Biocholine source CHOLI HERB is non-hygroscopic, non-production of Tri methyl oxide, non-corrosive and compatible, so can be added as premixes, efficient at lower dosage and cost effective. Down regulates the production of Triglycerides and cholesterol, controlling the lipid metabolism, thereby preventing the fatty liver syndrome. As a hepato protector, optimizes bile secretion, prevents aflotoxicosis regularizes the liver functions. Optimum cell synthesis Prevents Perosis in poultry, the feet of the bird remain in their healthy state. Optimizes hatchability. Optimises growth, egg production, feed efficiency and livability of animals.

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Enhances fat metabolism and improves carcass quality. Choli Herb can replace Synthetic Choline Chloride, provides 100% Choline for optimum growth. This scientifically standardized formulation guarantees the accurate bioequivalence of the Phyto chemicals that could replace100% of the synthetic choline chloride without disturbing the vitamins and lower costing and inclusions. With better lipid metabolism, hepato protective action, improves the hepatic functions and prevents steatosis, also supports neuro transmission, better energy utilization, optimizes l creatine level. Scientifically formulated feed supplement that contains non-toxic natural and stable bioactives functions as a Choli Herb, constituted only with natural herbs, is a unique herbal animal feed supplement that contains natural, stable and highly bioavailable.

Conclusion

CHOLI HERB (Phytogenic BioCholine) is a unique herbal animal feed supplement that contains selected herbs rich in non-toxic and highly bioavailable choline in conjugated/ esterified form (Phosphatidylcholine). The phosphatidylinositol, also known as a part of lecithin group is associated with cholinomimetic bioactivity**.** The natural choline conjugates present in Bio Choline enter into the biological system and release highly labile methyl groups into the site of action. The labile methyl groups of Bio Choline help in energy metabolization and to control FLS. Choline in conjugated / esterified form i.e. Phosphatidyl choline (PC) and equivalents along with other phospholipids and essential fatty acids.

- Esterified Choline confers receptor recognition, higher bioavailability and negligible transformation of choline to TMA.
- Choli Herb also contains glycerols, phosphatidyl ethanolamine (PE), phosphatidyl inositol (PI) and phosphatidyl serine (PS) which play significant role in metabolism, enzymic modulation and biosynthesis of phosphatidyl choline.
- Choli Herb also contains essential fatty acids in highly utilizable form of its constituent phosphatidyl choline which are efficiently used by animal systems to produce essential prostaglandins, necessary for maintenance of good health.
- Along with these essential fatty acids and other phospholipids they optimize fat metabolism and efficient dispersion of liver lipids and produce significant growth response.
- The phosphatidyl inositol, also known as a part of lecithin group is associated with cholinomimetic bioactivity and helps in brain and nerve cell nutrition.
- Choline and inositol, both are essential components of cell walls and play important roles in cell integrity, cell growth and function. Without both inositol and choline, the two important dietary emulsifiers, the dietary fats and bile become trapped in the liver, causing FLS (Fatty Liver Syndrome), Liver Cirrhosis and blockage in fat metabolism.
- Choli Herb, in the natural, organic and bio-efficient form in the ingredient herbs also helps to optimize lipid and carbohydrate metabolism, improve glucose/energy utilization and reduce carcass fat content.
- The herbs in Herbal Choli Right help to improve the integrity of hepatocytes, optimize liver function and enhance the synthesis and bio-availability of bile for optimum absorption and utilization of fats.
- The peroxisome proliferator-activated receptors (PPARs) are a group of nuclear receptor proteins. PPARs play essential roles in the regulation of cellular differentiation, development and metabolism (both energy & protein.
- As feed supplement to provide highly bioavailable, bioactive and natural Choline in conjugated esterified form to maintain health and production.
- For maintaining optimum mobilization of hepatic fat and transportation of lipids from liver to adipose tissue, to help the liver from being affected by fatty liver syndrome.
- To improve utilization of high energy diet along with better FCR
- Additional Benefits:- Improves skeletal & muscular growth Improves the Anabolic effect

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Optimum production & Cell growth Enhanced Convalescence Healthy Digestion

- ❖ CHOLI HERB (the ideal herbal bio Choline chloride) indicates that this evaluated the herbal source of biocholine is a potential and possible substitute for synthetic choline chloride in diets and in nutrition.

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