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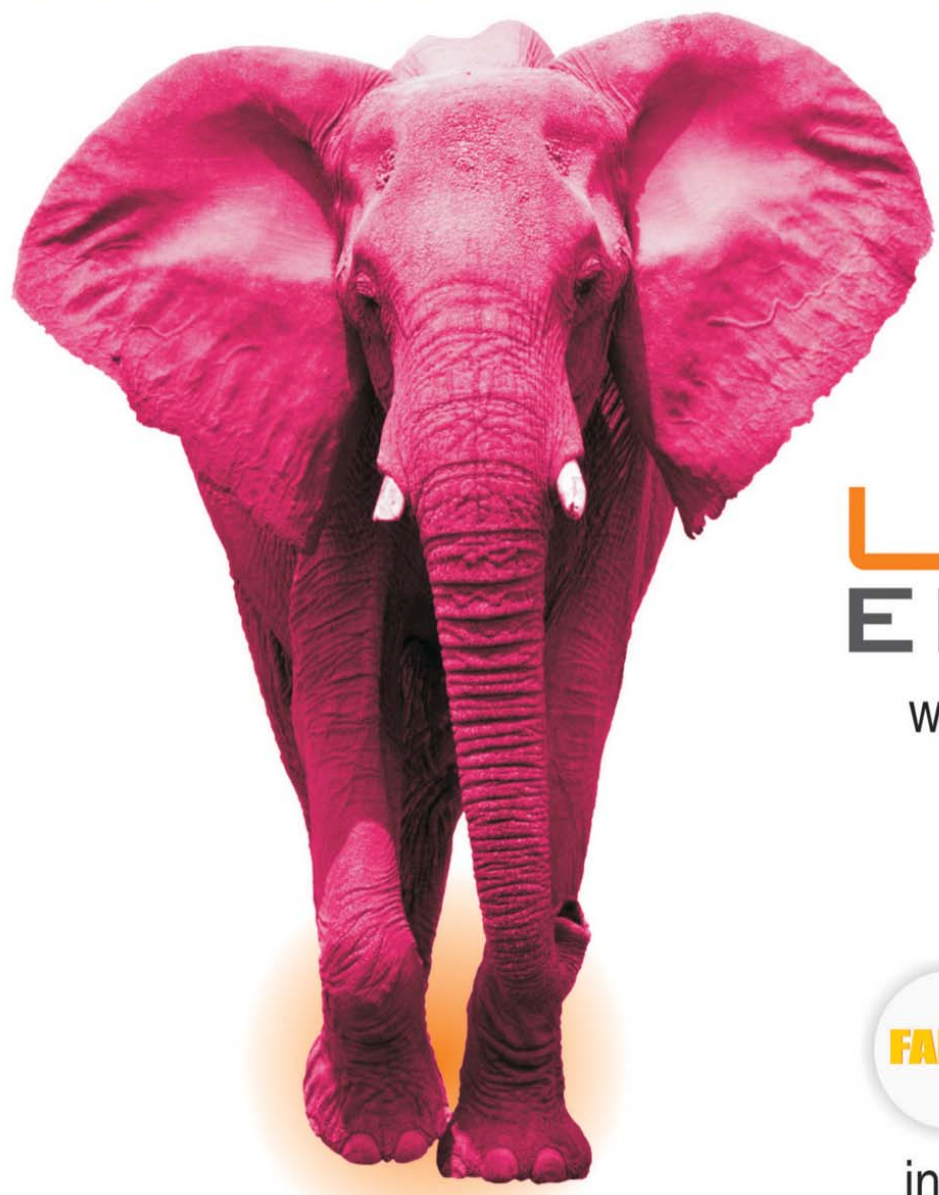
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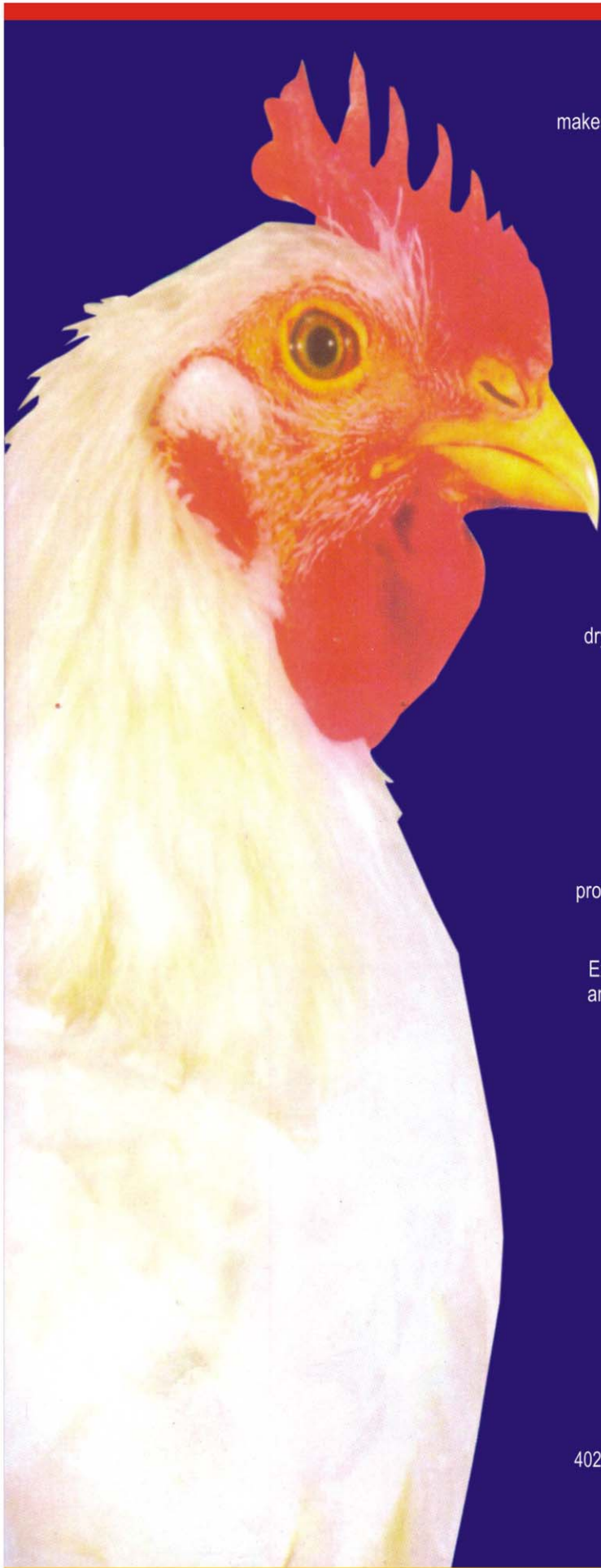
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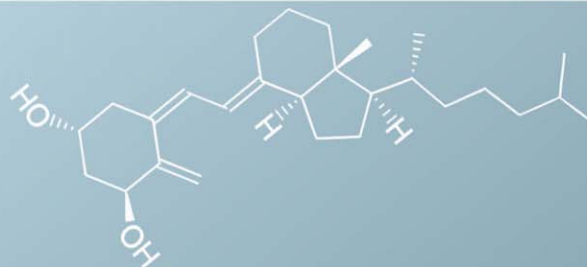
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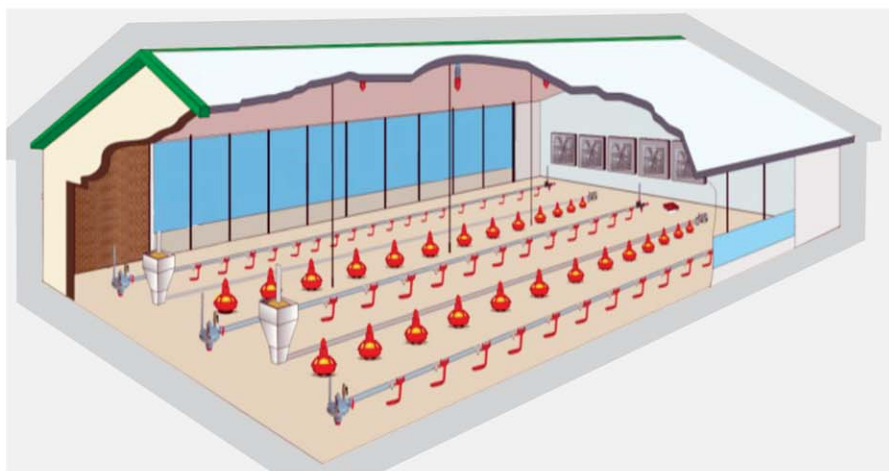
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Press Meet of Novus during opening of new office at Chennai



Q1. Can you briefly describe the history of Novus and its business?

François Fraudeau: Novus was born in 1991 and at the time we were solely producing ALIMET® feed supplement, or HMTBa, a methionine hydroxy analogue. Over the next 15 years we focused on bringing this product to animal protein producers around the world. Then, little over a decade ago, we saw an opportunity to diversify our product offerings through both in-house innovations and acquisitions and now we sell around 160 products worldwide. It has taken us 28 years but today we are the largest feed additive producer in the United States. We have a comprehensive portfolio of products that include liquid and dry methionine, chelated trace minerals, organic acids, enzymes, essential oils, pigments, feed preservatives and stabilizers, and feed hygiene and health solutions.

Specifically concerning India, in 2009, I asked Dr. Vaibhav Nagpal to develop a business plan for the country. From there we began to offer products to the poultry industry and then later expanded our

footprint in dairy and aquaculture markets. As those markets have grown in the country, so has our team in India. This new office is a very clear indication of Novus's commitment to serve producers here in every capacity that we are able.

Q2. Can you explain why your products are so tempting for India- and South Asian-specific markets?

François Fraudeau: What we are trying to do as part of our company mission is to be physically close to our customers. Our headquarters is in the United States but we have offices in over 30 countries so as to better understand our customer's challenges and more easily deliver solutions that help our customers in a sustainable way.

When I started my carrier in 1988, the goal of every customer was to increase production. That isn't the case any longer. Yes, optimizing production is still important but now customers think about biosecurity, food safety, animal welfare, and environmental factors. And the importance of these additional

concerns varies from place to place.

It's our job to bring solutions to our customers. For India, a big part of that is supplying enzymes that can boost the value of raw feed material. Enzymes enhance the value of crops produced in India. Also, we sell a lot of organic trace minerals in India because our product has been demonstrated in studies to help strengthen eggshell quality. Research has also shown that MINTREX® trace minerals, can reduce the incidents of skin lesions, footpad dermatitis and wooden/woody breast, which are challenges for Indian producers due to the wet market.

Dave Dowell added: Novus also brings considerable application knowledge to our customers. Our team in India is very skilled in this area. Because each product is different, and each challenge varies from farm to farm, it's important that our technical service professionals can effectively train customers on the best application of our product. Our customers may be using our products for the first time, or they may not know how to use it in combination with other additives in the ration. We can help guide customers, answer their questions and bring in experts from our global technical services and R&D teams, as needed.

Dr. Vaibhav Nagpal added: When we came to this market, Novus teamed up with universities and colleges like Bombay Veterinary College, Namakkal and Nagpur veterinary colleges. We sponsored the studies of the students and we conducted our own studies for almost three years to really learn the value we can bring to customers in India. That investigation and planning helped us to really understand how our products could work in this part of the world. So, we greatly understand how our products work in local conditions and help to address customer pains.

Q3: Poultry is playing a major role in India and India is having vast potential as well as protein concerns. Major concerns are biosecurity and feed. To eliminate diseases, what are the plans to expand the business and products so that India can step ahead?

François Fraudeau: We must use technology if we are going to be able to provide enough quality food, safely and inexpensively, for the growing world population. Producers must use feed additive technology to optimize immune response, bone strength and nutritional availability of feed. We simply cannot feed the world without technology.

Scott Hine added: We work with our customers to solve their problems. Whether the problems are with meat quality, biosecurity, gut health, or mortality rates of the animals, we are always looking at more effective ways to support health through nutrition.

An added benefit of being a global company so close to our customers is that we're able to see what works in one place and duplicate that success elsewhere. It gives us a different perspective, and through that new vision we can develop new products and solutions for the customer.

Q4: What are the factors for growth of Novus?

François Fraudeau: The number one factor is the growing population, the second is the growing economy. That's the story of India and it's the story globally. Poultry production is increasing 10% every year, there's a growing population here and household incomes are increasing. These factors are very important because they trigger investment.

We have the advantage of being able to predict with some accuracy the number of people on the planet next year and well beyond that. We can predict how much chicken and eggs will be eaten based on trends year over year. This information is very important and very helpful to a feed additive company like Novus. It tells us where to invest our research, which markets to invest in and which products to put in the market.

Q5: Do you have any products for antibiotic-free usage?

François Fraudeau: For us, antibiotic-free production is not new, we've been supporting it for the last 15 years in Europe. We've expanded our solutions to other countries like Thailand and Brazil that export meat to Europe where antibiotic-free is becoming the norm due to stringent regulations.

Antibiotic-free is possible but there is a lot of thought and planning that must happen before a farm makes the switch. You must consider the environmental factors on the farm as well as external factors like feed quality.

Scott Hine added: For example, we provide protected organic acids (AVIMATRIX®) to help gut health, which is one part of the solution. We also provide essential oils (NEXT ENHANCE® 150), which is another part. Our technical team understands the environmental and hygiene factors and knows the mode of action of our products so they can develop

a comprehensive antibiotic-free program for customers.

Dr. Vaibhav Nagpal added:Our products are just a part of the whole solution. We need to look at the biosecurity system, the farm management systems, we need to look at the feed; even the types of raw materials, the particle sizes, the pelleting temperature, how the feed mills are managed, the transportation systems. These are all the pieces that go into developing an antibiotic-free program. Sometimes customers just ask for the products and we supply them with mode of action details, but they may not work effectively if other factors have not been properly addressed.

We have expertise in Europe and now we are working to bring those Novus representatives and their knowledge to India to connect with the customers on their farms, conduct a thorough audit of their production systems and develop recommendations based on that.

Q6: Novus office was in Chennai for a long time, now with the opening of new and bigger office to better serve the need of South Asian countries as well as India, you should have some future plans, so what are they?

Dave Dowell:Our first office in India was in Bangalore then we moved to Hyderabad and then to Chennai in 2009.

With this new office, we are continuing to expand the team so that we can better serve our growing customer base. The sales, marketing, and technical service teams are adding positions and we have new products to introduce to the market in the enzyme blends space. I am very excited about the growth we have experienced in India and the future growth potential we see. Novus will continue to invest in the region and bring new technology to our customers there.

Q7: What are the prospects of Novus products used for dairy production in India? Being dairy is an unorganized structure how we can educate the farmers related to dairy?

Dr. Vaibhav Nagpal:We definitely work with the customers to show them how our products are effective on a nutritional level. For instance, our ALIMET® and MHA® methionine products optimize animal health and milk fat yield. We have MINTREX®, which supports reproductive performance, and has been shown in studies to help reduce lameness and

hoof problems. We have essential oil products that play a big role in optimizing productivity. So, we have many products but the challenge is how do we reach dairy farmers because the Indian dairy market is so fragmented? Our approach is to invest in channel partners. We have identified a few companies to collaborate with and now they are helping us identify and reach those potential customers. These partnerships are important for us to reach out to the dairy industry in India so that we can educate the farmers and nutrition through our channel partners.

Q8: Aquaculture in India is far behind when compare to other countries and production is not up to the mark. So how do your products help to increase production and add value?

François Fraudeau: The great advantage with aquaculture is that everyone can eat the product, so there is a drive to be in this industry. But it can be an expensive enterprise. For those who produce in ponds, the cost of land in India is a huge investment. Beyond that, the risk of disease is very high in an open body of water. So, we look at our products and contemplate what species-specific solutions can be offered to the producer who is just trying to keep their fish or shrimp alive.

Q9: Where do you see Novus in next ten years?

François Fraudeau: Beyond this recent expansion in India, our next expansion will be in Africa. The population there is growing but they don't have many quality raw materials and the industry is still developing there in terms of processes and infrastructure.

At a global level, we will continue on our path to help feed the world but we must also accelerate the pace of innovation because the consumer is changing very quickly and regulations are also changing very quickly.

All told, the animal production industry moves very slowly where innovation is concerned. We must consider that the population is growing and that farmers are being asked to produce more high-quality animal protein on less land with less environmental impact for an end product that is still affordable. The feed additive industry can help, but we need to innovate quickly. The pace at which we will be able to address these challenges will determine our success.

Scott Hine added:For Novus to meet innovation goals, we continue to identify technology partners.

For instance, we work closely with well-known genetics partners to develop nutrition solutions that will help address wooden/woody breast at the commercial customer level. We have been very successful in this, globally. We also know there are companies that we can work with synergistically to develop application solutions for customers. So, if we go back to the question of what's the unique proposition of selling Novus, the breadth of the products and the ability to apply solutions at the customer level is something that is very unique. In addition, as we learn about modes of action through research and development, we look for new technologies and partners that can provide the tools to help us help our customers and do what we do even better.

Q10: Where do you see the livestock industry in India in the next ten years?

Neeraj Kumar Srivastava: There are three factors to consider: the availability of animal protein, the demand for animal protein, the affordability of animal protein. These are critical factors. If we look at population growth, 380 million people are projected to move toward the middle-class group in India in the next 10 years. As you can imagine the protein requirement of this country in coming five to ten years is going to be enormous. The cheapest source of protein will be chicken and eggs and India has huge potential to grow its chicken and egg production to meet the protein demand of the country. We are not looking for the export market to meet the domestic demand. I see the livestock industry in India as very attractive, very lucrative and one of the fastest growing in the world.

Q11: What are the new products in pipeline?

Scott Hine: If you look at our different product

platforms, our methionine platform is consistent, and we see our opportunities in the Indian dairy industry to expand that business. We are also launching our CIBENZA® PHYTAVERSE® phytase enzyme globally and are rolling out CIBENZA® EP150, a protease combined with a probiotic that allows for a guaranteed level of spores in the product, to help support gut health. We are also looking at the opportunities in India for our antibiotic-free solutions as well as our eubiotics products.

Neeraj Kumar Srivastava added: We also just launched a proteinate organic trace mineral in the country and that was a massive success. We are looking to take that product beyond the region.

Q12: Anything Novus is doing in terms of digitalization and artificial intelligence?

Scott Hine: We believe there is a huge opportunity in "big data". We started in this area years ago with our C.O.W.S.® ruminant performance assessment program. In the end, however, it really comes down to analysis and comparative analysis, which is our area of expertise in terms of R&D and application of that knowledge. Working closely with our customers is extremely important to us as we help provide unique solutions to their unique problems. What we are doing with the C.O.W.S.® program is monitoring and recording their behavior then taking that data and analyzing it. Then we work with professional dairy nutritionists and people who have good experience with cattle to identify what could be done differently to increase that cow's comfort and ultimately its productivity. This is not a new program and we have seen that when a producer uses the recommendations that come out of the analysis, they see a significant lift in production.

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Mycotoxins in Poultry Feed: A Review

OCCURRENCE OF MYCOTOXINS IN FEED

Factors affecting the production and occurrence of Mycotoxins in crops and consequently, the extent of contamination in feed and food involve climate conditions such as temperature, relative humidity; and agricultural practices such as fungicide usage and techniques used in agriculture. Other factors may include drying, processing, handling, packaging, storage and transport conditions. Insects play an important role through physical damage of the grains and mechanical transmission of the microorganisms. Most of cereal grains, oil seeds, tree nuts, and fruits (especially dried ones) are susceptible to fungal attack and mycotoxin formation. Agricultural products like cereal grains and forages can be contaminated during pre-harvest (field period), harvest, and post-harvest (storage and transportation period). Corn and other grains used in animal feed could also be contaminated by pathogenic moulds, thereby mycotoxins, even they may be destroyed at different rates during industrial processing.

Distribution of mycotoxins varies according to fungus nature. Depending on the geographical and climate conditions, different fungal species can invade foods and feedstuffs. For example, Aflatoxins are mostly expected in tropical areas where climate conditions and storage practices are favorable to fungal growth and toxin production, while Ochratoxin A is frequently detected in moderate and subtropical regions; Fumonisin in subtropical and tropical locations; Zearalenone and Tricothecenes are worldwide mycotoxins (Sweeney and Dobson, 1998; Afsah-Hejri et al., 2013). In general, the crops are susceptible to contamination by the most dangerous mycotoxins in tropical and subtropical areas with high humidity and temperature. AFs are ubiquitous in corn-based animal feed and mostly present in groundnut meal and cottonseed. OTA may be present in most of cereals, corn, hay, oats, and wheat, and also in oilseed products, particularly if the products were not dried well after harvest. Corn is a major source for ZEN particularly if it is not harvested on time. Interestingly, ZEN has been detected in damp hay and straw. Furthermore, corn, wheat, barley, oats,

rye and other crops have been reported to contain T-2 toxin and DON (Tricothecenes).

MYCOTOXIN BINDERS AGAINST MYCOTOXINS

Possibly the most common range of products currently available on the market for the control of mycotoxins in feed are those products falling under the broad category of mycotoxin binders. Characteristics of an efficient mycotoxin binder are:

- absorb a range of mycotoxins
- have a low effective inclusion in the feed
- show rapid and even dispersion in the feed during mixing
- be heat stable during pelleting and processing
- not bind other in-feed nutrients such as vitamins and minerals
- have a high stability at a wide range of pH
- be biodegradable following excretion

In addition the binding properties observed *in vitro*, i.e. total and stable binding as well as *in vivo* efficacy are extremely important properties of any binder. Stable binding is a more important measure of efficacy than total binding as variation in gut pH, gut contents and the effect of enzymes amongst other factors may influence the stability of the bound complex. If the binder-mycotoxin complex is not stable the binder may release free toxins in lower parts of the GIT and these will become available to the animal for absorption.

Hydrated Sodium Calcium Alumino Silicate (HSCAS)

HSCAS is a broad grouping of clays and zeolites (both of which can be classed as aluminosilicates) which contain some internal water of crystallisation and lesser amounts of sodium and calcium in the form of exchangeable cations or their soluble salts (Taylor, 1999). However as a result of the broad nature of this classification, there is considerable variation in the structure and chemical composition of this class of compounds. Consequently not all HSCAS are the

same with respect to their ability to bind mycotoxins and the subsequent stability of this bound complex. Binding ability and stability of any HCSAS will be dependent on surface pH, pore size and availability of exchangeable cations, amongst others. It is therefore of utmost importance to establish the binding ability and stability of HSCAS before it is used as a toxin binder. HSCAS to have a high affinity for aflatoxin B1 *in vitro*, however, its efficacy against zearalenone, and ochratoxin A is limited and that it is virtually ineffective against tricothecenes such as DON and T-2 toxin.

Activated Charcoal

Activated charcoal is the residue derived from the destructive distillation of organic matter of vegetable origin and shows different adsorbing properties depending on its origin. It has a high binding capacity and the efficiency of adsorption is unaffected by the pH of the toxin, with the adsorbed material usually retained through the entire GIT.

Although it is generally accepted that activated charcoal will bind both aflatoxin and ochratoxin A successfully, reports relating to the efficacy of activated charcoal as an aflatoxin binder are varied and contradictory. It has been reported that activated charcoal was an impractical method of reducing ochratoxin A toxicity. The efficacy of super activated charcoal in reducing some of the toxic signs of chronic aflatoxicosis was marginal in growing broilers but was of benefit against T-2 toxins.

Clays and zeolites

Clay and Zeolitic minerals are a diverse and complex range of aluminosilicates with a wide variety of functional properties. In general however, clays possess a distinctive layered structure whilst zeolites possess a highly porous three-dimensional network of interconnecting pores (Taylor, 1999). Both the mineral classes are made up of at least 30 different naturally occurring variants each possessing specific and characteristics differences in their chemical and structural make up (Taylor, 1999). They vary considerably from source to source and do not have equal affinities and capacities for aflatoxins and other mycotoxins, thus they should be rigorously tested

one by one and thoroughly characterised *in vivo*, paying particular attention to their effectiveness and safety for sensitive animal models.

Yeast Cell walls

Saccharomyces cerevisiae has been found to alleviate the adverse effects of mycotoxins in poultry and these beneficial effects were later attributed to the presence of esterified glucomannans derived from the cell wall of *Saccharomyces cerevisiae* 1026 (Aravind *et al.*, 2003). Subsequently esterified glucomannans were shown to be effective in binding several commonly occurring mycotoxins such as aflatoxin, Ochratoxin A, Zearalenone and T-2 toxin. The precise mode of action of esterified glucomannans is not known although irreversible entrapment of mycotoxins, stimulation of the immune system, alteration of intestinal microbial environment and provision of nutrients beneficial to gut flora have all been proposed.

Conclusion

As a result of variability associated with the production and structural and physical properties of mycotoxins it is unlikely that a single solution for all mycotoxins will apply and some flexibility will be required in the approach adopted to deal effectively with the problem of mycotoxins. For instance, to tackle mixed mycotoxicosis (which is generally more common in field conditions), using a combination of mycotoxin binders would be more effective than using a single binder. In order to effectively manage the threat of mycotoxins, the entire supply chain for animal feed must be involved. Effective quality control methods such as HACCP and GMP along the length of the chain should be implemented to reduce the potential for mould growth and subsequent mycotoxin production. Mycotoxicoses may be prevented by careful choice of feed raw materials, reduction in water content of the raw materials and hygienic storage. Feeds with high levels of fishmeal are particularly susceptible and should not be stored for more than 3 weeks. Pelleted feed may reduce fungal counts but does not affect toxins. So, a constant attention throughout the entire supply chain for animal feed (process of grain harvest, shipping, storage, feed manufacturing, and its formulation) is required.

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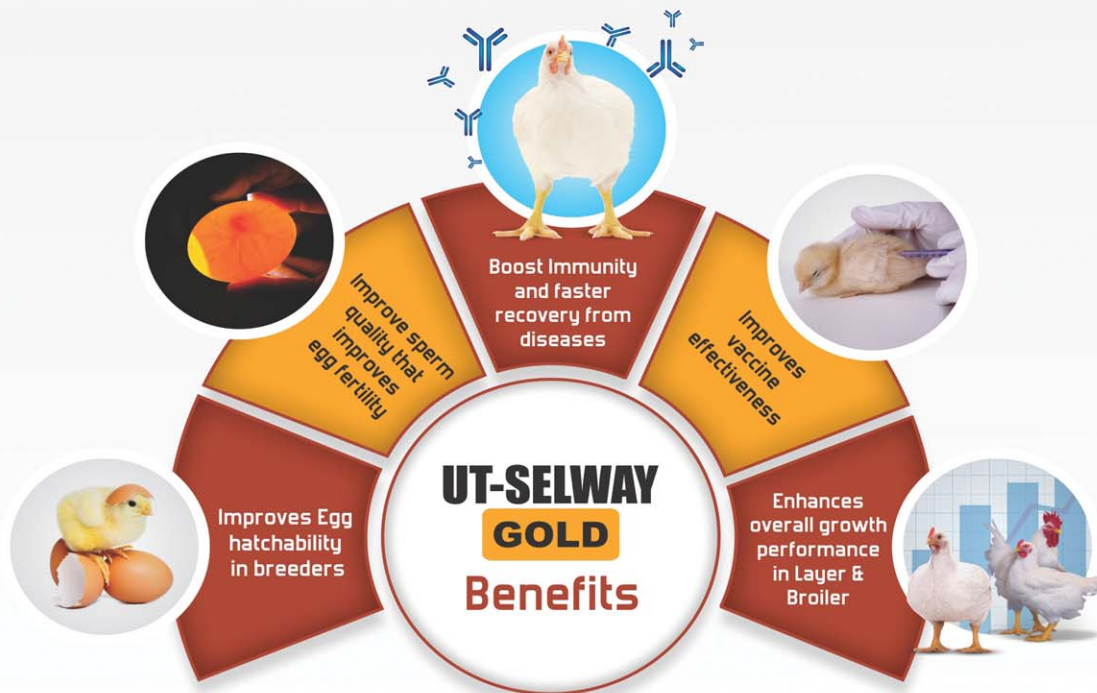
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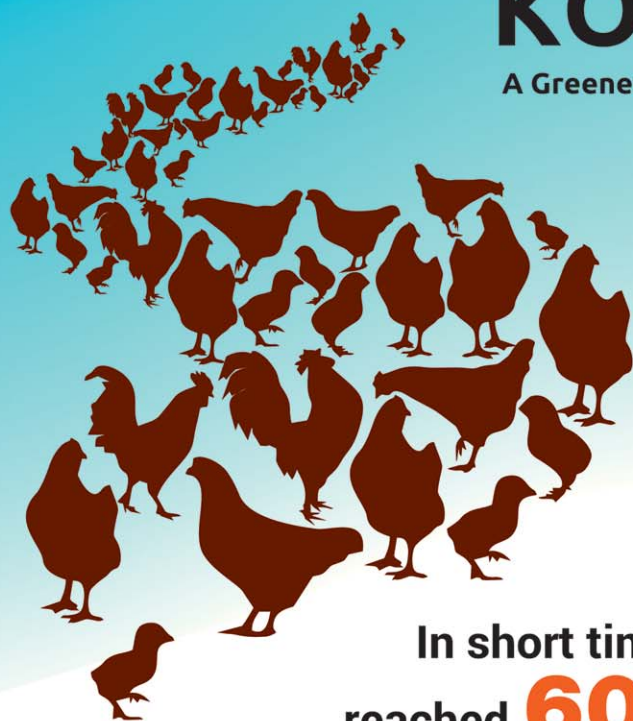


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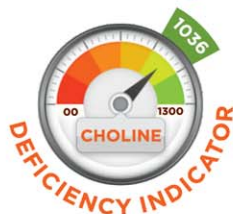
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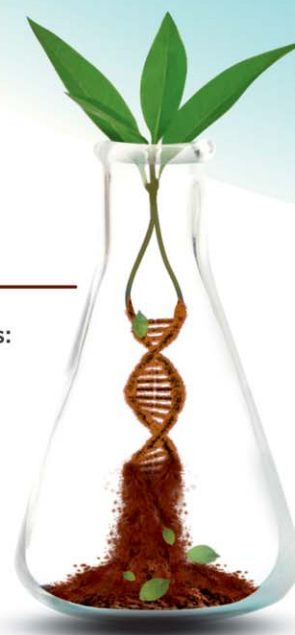
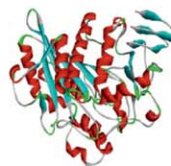
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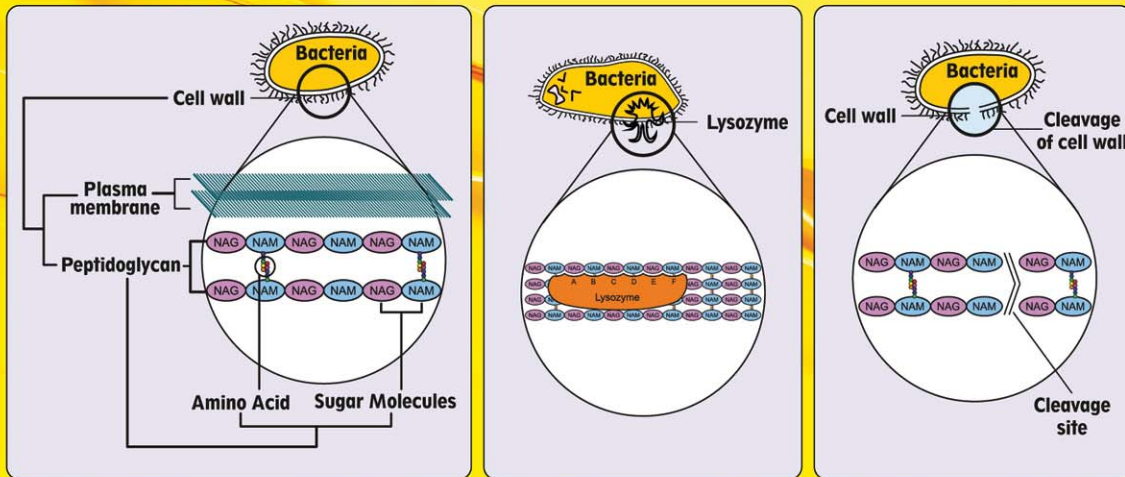


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Duck Farming - An Overview

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Ducks are believed to have been domesticated by Romans in Europe and Malays in Asia few thousands of years ago. As per FAOSTAT, 2014 leading producers of duck meat in the world are China followed by France, Malaysia, Myanmar and Vietnam. Of the total ducks reared in India 90% are indigenous and form the second largest species contributing for egg production. As per, livestock census 2007 in India ducks constituted about 8.52% of total poultry population and counted for about 27.43 million in number. In India, West Bengal, Assam, Kerala, Andhra Pradesh and Tamil Nadu are the leading states in duck population. Ducks are reared for egg, meat and the size of egg is about 4.5% of ducks body weight whereas, that of poultry is 3.3 % of its body weight. Ducks are more prolific compared to chicken and are more adapted to free range system of rearing. Ducks can be raised without water in the same way as chickens are raised. But to get fertile eggs, male ducks and water is essential. Ducks have oily feathers which cover the whole body, so water can't directly enter inside their body. The layer of fat under their skin also prevents them from getting wet. Their legs work as the paddle of a boat. Duck's lips are very strong and with this lip they can eat moss, insects, fish egg, hard snail etc. There are numerous meat and egg productive duck breeds available throughout the world. Duck rearing in India is concentrated in the hands of small and marginalized sections of society and has not seen the light of industrialization as in case of poultry. The states along the coastal belt of India with inland water resources provide the required natural potential for duck rearing. Considering the hardiness, active foraging ability, adaptability of the ducks to grow in free range system and the less cost input in rearing them, these act as a reliable source of livelihood for many poor rural farmers.

BREEDS

Duck rearing in India is un-organized and most of the individuals involved in this sector rear indigenous variety recognized breeds like Campbell, Pekin and Muscovy could be found in few states. Peking, Ayleshbari, Maskovi, Ruel Kagua and the Swiden ducks are most popular for meat production. Indian Runner is a popular layer duck breed. White and grayish Indian runners are good layers. Khaki Campbell ducks are also very popular breed for high egg production.

Central Poultry Development Organisation (CPDO) located at Hessarghatta, Bangalore, Karnataka a Govt. of India funded institute supplies quality ducklings of egg and meat type to farmers at subsidized rates and also are involved in imparting training to farmers and other stakeholders in duck rearing and management. CPDO maintains and supplies stocks of Khaki Campbell (Egg Type) and White Pekin (Vigova Super-M) (Meat Type).

EGG TYPE:

1. Campbell:

Campbell is a breed of duck with its origin in England, was developed from crossing Mallard, Rouen and Runner ducks. They are reared for their high egg laying capacity. Campbell ducks are available in three colour varieties: khaki, dark and white. The adult weigh about 1.5 to 2.5 Kg. They are active birds with long, neck, bill, head and body. The khaki variety has a green bill, dark brown eyes and rich dark-orange/brown legs and feet. Its head, upper neck, lower back, and tail culverts are brown-bronze while the rest of the plumage is a warm khaki. They are active foragers, start laying eggs from the age of 5-7 months and lay an average of 24-300 eggs per year. Egg size varies from 65 to 75 gm.

2. Indian Runner:

The origin of these duck is believed to be from islands of Indonesia. They are unique in their posture and stand erect like penguins and run rather than waddle. The weigh about 1.4 Kg to 2.3 Kg and lay an average of 150-200 eggs per year. The eggs are greenish blue and skin is pink in colour. The colour of these ducks includes those of Fawn & White, White, Penciled, Black, Buff, Chocolate, Cumberland Blue, and Gray. Their height was ranges from 50-76 cm. They have long, wedge shaped head, body is slim but round in appearance and males have a small curl on the tip of their tail.

MEAT TYPE:

1. White Pekin:

Pekin or White Pekin breed of duck reared in America finds its roots from China. They have a solid built body, head is long, rounded, thick neck and their breast is smooth and broad. The plumage is creamy white in colour, the legs and feet are a yellowish orange whereas, the beak is yellow colored. They are short and almost straight. They are large framed, hardy and adults weight about 4.0-4.5 Kg. Pekin are calm-tempered and are fertile. They are reared principally for meat. They lay about 125 to 225 eggs per year. It attains about 2.2 to 2.5 Kg of body weight in 42 days of age, with a feed conversion ratio of 1:2.3 to 2.7 Kg.

Breeding

Water is a must for breeding purpose. Usually ducks don't mate without water. One male duck is sufficient for breeding 10 female ducks. Usually high quality and productive duck breeds start laying eggs at their five months of age. Each egg weights about 50 to 60 grams. Usually duck eggs take about 28 days to hatch. During the hatching period, sprinkle the eggs with water occasionally (two or three times per week). Refrigerator, lime water or pyraphine can be used for storing the eggs.

Floor Space

Overcrowding ducks can be extremely detrimental to their health, growth or egg production. Providing

adequate floor space at each stage of development is basic to successful duck rearing.

Age of days	Space/Duck (sq ft)
1	0.31
2	0.62
3	1.10
4	1.47
5	1.90
6	2.28
7	2.48
Developing breeders	2.69
Laying breeders	3.02

Flooring for Ducks

The smooth skin of ducks is not as tough as that of land fowl, and is more susceptible to injury when ducks are confined on surfaces that are too rough, or abrasive. Slats, wire floors or cage bottoms may cause injury to the feet and legs of ducks, unless these surfaces are smooth, non-abrasive, and free of sharp edges. If wire floors are used, floors for ducklings under 3 weeks should be constructed of 1.9 cm (3/4 inch) mesh, 12-gauge welded wire, attached to a frame designed to keep the wire flat, and minimize manure accumulation. For ducks over 3 weeks, 2.5 cm (1 inch) mesh is best. Vinyl coated wire is preferable, but smooth galvanized wire is satisfactory.

Optimum Temperatures for Ducks

Age of days	°C
1	30
7	27
14	23
21	19
28	15
35	13
42	13
49	13
Developing breeders	13
Laying breeders	13

At the time of hatching, ducklings require a high temperature as they are not yet able to regulate their body temperature and must have supplemental heat

such as that provided by a brooder. As they grow older they become better able to produce and conserve heat, and regulate their body temperature. The recommended temperatures for ducks at different ages are given below.

Lighting

The length of the laying period of ducks can be increased considerably if supplemental lighting is provided. Adding artificial light to extend the daily light period to 14-17 hours, and preventing any decrease in day length, will provide adequate light stimulation for ducks to lay continuously for 7-12 months, depending upon their ability to lay, and other conditions. A light intensity of about 10 lux (1 foot candle) at the duck's eye level is sufficient to stimulate adequate sexual response in both drakes and ducks. In practice, however, breeding and laying ducks are commonly lit to provide 2030 lux at duck level. Artificial lighting is less important for growing ducks.

Management of Litter and Yards

Ducks drink and excrete more water than chickens. Their droppings contain over 90% moisture so to maintain litter floors in a dry condition there should be regular addition of fresh bedding, on top of the bedding that has become soiled or wet, and when necessary, cleaning out the old litter and replacing it with fresh litter.

Feeders and Waterers

Most feeders and waterers used for other poultry are satisfactory for ducks, provided sufficient room is allowed for the larger bill of ducks and their "shoveling" eating motion. During their early stages of growth, ducklings eat frequently, much like chickens. Provide about 1 inch (2.5 cm) of feeder space per duck for about the first 3 weeks then reduce gradually to about half this amount so long as there is no crowding at the feed hoppers. Developing breeders requires about 4 inches (10 cm) of linear space per duck.

Trough, can or jar-type waterers can be used so long as the drinking area is wide enough (at least 4

cm) for the duck to submerge its bill. Nipple waterers, if properly adjusted for the duck's height, are also satisfactory. For starting and growing ducks, a minimum of about 1 inch (2.5 cm) of linear watering space per duck should be provided. This should be increased to 2 inches (5.0 cm) per duck for developing and laying breeders. If nipple waterers are used, provide 15 nipples per 100 ducks for starting and growing ducks and 20 nipples/100 ducks for developing and laying breeders.

Feed and Water

Ducks generally eat almost all types of food they find edible. If available and affordable, provide nutritionally complete commercially prepared duck feeds. If duck rations are not available, and chicken feeds are, they will serve as a satisfactory substitute. Poultry feed concentrates when fed with grain constitute a nutritionally complete diet and may be a good option. Ducks, like other poultry, do not actually require "protein" but the individual amino acids contained in dietary proteins. When formulating feeds for ducks, primary attention should be paid to meeting the ducks essential amino acid requirements.

Plenty of clean drinking water should be available to ducks at least 8-12 hours per day. In some management systems it is advantageous to shut off feed and water at night to help maintain litter inside buildings in a dry condition. During periods when temperatures are above 90°F, drinking water should be available in the evening until the temperature has dropped below 80°F, or else made available all night.

Disease

All the necessary steps should be taken to prevent disease outbreaks in ducks and in cases where ducks do become infected, administering appropriate treatment to minimize mortality and morbidity. Entry of potential carriers of infectious material such as people, trucks, poultry crates and equipment must be denied unless appropriate disinfection measures are taken. Ducks should be immunized against known infectious diseases. Environ-

mental stresses should be minimized which may cause ducks to become susceptible to infections. Ducks are particularly susceptible to certain toxins like Aflatoxin poisoning, Botulism, Castor bean poisoning, and Rapeseed meal. Some of the common diseases of ducks are

1. Duck Virus hepatitis

It is a highly fatal contagious disease of young ducklings, 1-28 days of age. The onset of the disease is very rapid, it spreads quickly through the flock and may cause up to 90% mortality. To prevent this disease, breeder ducks should be vaccinated with an attenuated live virus duck hepatitis vaccine (to produce maternally immune ducklings).

2. Duck Plague (Duck Virus Enteritis)

It is an acute, contagious, highly fatal disease and is most likely to affect mature ducks, but is also seen in young ducks. Regular immunization of breeder ducks with an attenuated live duck virus enteritis vaccine provides adequate protection.

3. Riemerella anatipestifer Infection

It is also known as *Pasteurella anatipestifer* infection, infectious serositis and New Duck disease. Preventive management and vaccination are effective means of control. Penicillin, enrofloxacin and sulfadimethoxine-ormetoprim (0.040.08% in feed) are effective in reducing mortality.

4. Avian Cholera

Also called fowl cholera, caused by the bacterium *Pasteurella multocida* is an important disease of domestic ducks, and is an especially troublesome disease of ducks in some parts of Asia. This disease is associated with poor sanitation, and standing water in duck pens. Good sanitation practices go a long way toward preventing this disease. Sulfadimethoxine-ormetoprim (0.02-0.04%) and Chlorotetracycline (0.044%). given in feed are effective treatments.

5. Colibacillosis

This disease causes reduced hatchability, infection of the yolk sac, a septicemia in ducks 2-8 weeks of

age and salpingitis and peritonitis in breeder ducks. Good sanitation and management are important preventive measures. Sulfadimethoxine-ormetoprim (0.04-0.08%) and chlorotetracycline (0.044%) in feed are helpful in controlling this disease.

Advantages of Duck Farming

There are numerous advantages of starting duck farming business. You can raise ducks in both commercial and small scale meat or egg production purpose. Even, you can raise some ducks on your own backyard with other birds or animals.

- 1) Ducks need less expensive and simple housing facilities so housing costs are very less for setting up commercial duck farming business.
- 2) Ducks are very hardy bird, need less care or management and are resistant to many avian diseases. They can adopt themselves with almost all types of environmental conditions.
- 3) Ducks lay about 40-50 eggs more than chicken and are 1520 grams larger than chicken eggs. They lay eggs either at night or in the morning so fresh eggs can be collected every morning and farmers can do other work during rest of the day.
- 4) Comparatively less space is required for raising ducks. They have shorter brooding period and ducklings grow faster. They have less mortality rate and usually live longer than chickens. They have a profitable life as they also lay economically in second year, it reduces the cost of replacement.
- 5) Ducks can be raised with a wide variety of foods. A duck's regular food includes cassava, copra, corn, rice, fruits and any other low cost and easily available foods. They also have the natural tendency of foraging on aquatic weeds, algae, green legumes, fungi, earthworms, maggots, snails, various types of insects etc. which directly reduce feeding cost.
- 6) Marshy river side and wet land are excellent quarter for duck farming where chicken or other types of livestock will not flourish. Cannibalism

and agnostic behavior which is very common in chicken is not usually encountered with ducks. Ducks are suitable for integrated farming systems, such as duck cum fish farming.

- 7) Duck products such as eggs and meat have a great demand in the local and international market. So commercial duck farming business can be a great source of earning.
- 8) The down and small body feathers of the ducks are valuable and used for different industrial purposes. Ducks are good exterminators of potato beetles, grass hoppers, snails and slugs.

However, for making maximum profits from duck farming business, farmers have to be more careful on taking care of ducks, feed management and accommodation, brooding and marketing. If all the processes are done well then one can make a handsome income from this business. Duck farming business can also be a stable employment source.

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The word Vice emanated from the Latin word *vitium*, which means fault or defect. It is an abnormal and destructive behaviour of a bird while referring to poultry. The commercialization of poultry farming paved the way to increased stress due to confinement in addition to unimaginable growth in production. Stress is the cause and consequence of vice since birds acquire vices due to confinement stress. These vices can cause direct and indirect loss of birds, its production and ultimately income to the farmers. However, wise managemental practices can avoid or mitigate vices. Therefore, it is inevitable for the farmers to be aware of vice prevention and control strategies in poultry.

Common vices in poultry

- Cannibalism
 - Head picking
 - Toe picking
 - Wing and tail picking
 - Vent pulling
 - Vent picking prolapse
- Egg eating
- Egg hiding
- Flightness
- Pica

Cannibalism

It is the condition in which birds fight and peck each other. It may extend upto eating the flesh that may result in deep wound and serious injuries to them. Once these vices established, it spread to all birds in the flock and the birds with redness or bleeding around the cloacal orifice is indicative of cannibalism vice. Vent pecking is the common form of cannibalism in laying birds. Cannibalism includes head picking, wing and tail picking, vent pulling, vent

prolapse and toe picking where the bright colour blood on these places attracts the other birds to peck in these regions.

Some causes of cannibalism are,

- Overcrowding of birds within a cage
- Genetic predisposition
- Deficiency of protein in the feed
- Haemorrhages around the cloacal region of bird due to laying which attracts other birds to peck
- Deficiency of amino acids viz., methionine, arginine in diet
- Salt and mineral deficiency
- Dermatitis (Inflammation of skin) or loss of feathers due to parasitic infestation.



Cannibalism in poultry

Control

- Debeaking is the efficient way for controlling cannibalism. While debeaking, one third of the upper beak and just tip of the lower beak should be trimmed with the debeaker with temperature of 327°C.
- Affected birds should be isolated and treated for wound. Margosa oil can be used effectively for healing wounds in poultry.

- Birds with the extensive cannibalism vice can be culled.
- Sufficient quantity of minerals, salt, protein and amino acids (especially arginine and methionine) should be maintained in the feed of poultry.
- Avoidance of overcrowding by providing proper space to the birds
- Fish meal content of the diets should be increased.
- Sufficient quantity of feed should be made available all the times.
- Laying nest must be built in peaceful place
- Red bulbs can be kept near the laying area in order to prevent this habit.

Egg eating

Once the birds taste the broken/cracked eggs which occur during laying or accidental, they will acquire the habit of eating even their own eggs. Egg eating may be due to improper and insufficient bedding material. Leaving the eggs in the cage for long period of time may encourage the birds to taste the egg and start eating. Thin cracked egg is a factor of predisposition.



Egg eating in chicken

Prevention

- Eggs should be collected as soon as possible
- Isolation or culling of birds with vice
- Debeaking of the birds to prevent breaking of eggs
- Darkness in laying area may prevent this habit.

Egg hiding

This habit is prevalent in domestic birds due to more space for movement, they usually hide their eggs to prevent from predators. Hiding takes place in bushes and fields etc.,



Egg hiding in chicken

Prevention

- Reducing the movement of birds
- Laying area should be inside the house with suitable bedding material.

Pica

Pica is the vice of eating inanimate objects such as feathers, litter material, threads, dust etc., which were not good for their consumption. It is less common in modern poultry farm as they have been provided with adequate diet with proper nutrition. Predisposing factors of pica includes phosphorus deficiency, parasitic infection, new litter material etc. Balanced diet with mineral supplementation should be given with good management practise.

NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY / MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) JANUARY 2020

Name Of Zone \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Average	
	NECC Prices																																
Ahmedabad	512	515	516	516	516	495	495	495	497	497	485	485	485	470	470	470	470	472	472	460	460	460	435	425	425	425	425	425	425	425	425	425	469.29
Ajmer	490	491	482	472	458	457	458	458	450	440	433	433	418	420	423	426	426	426	420	405	395	395	385	372	365	360	360	360	360	360	360	-	417.73
Asansole	524	524	524	524	525	525	525	525	525	525	525	515	510	500	490	490	490	484	480	475	472	467	467	457	457	443	438	428	424	419	414	383	483.35
Barwala	488	488	488	472	457	457	457	457	441	437	433	433	419	419	421	426	426	419	405	405	405	385	375	375	365	355	355	355	355	355	-	418.26	
Bengaluru (CC)	483	485	485	475	475	465	465	467	467	467	467	450	435	435	435	435	435	435	435	425	425	415	415	405	405	395	395	385	390	390	390	437.06	
Brahmapur (OD)	482	484	486	488	488	485	485	485	485	485	485	475	471	461	461	461	457	447	447	447	447	432	432	420	420	410	419	407	395	387	377	449.19	
Burdwan (CC)	522	524	525	525	525	525	525	525	525	525	525	520	520	506	496	496	496	485	480	480	474	474	462	454	454	440	430	424	424	424	414	400	484.77
Chennai (CC)	495	495	500	500	490	490	480	475	475	475	475	460	460	445	445	445	445	445	445	445	445	445	445	445	445	425	425	410	410	395	395	400	450.8
Chittoor	488	488	493	493	483	483	473	468	468	468	468	453	438	438	438	438	438	438	438	438	438	438	438	438	418	418	403	388	388	393	443.8		
Delhi (CC)	512	512	512	512	512	500	485	485	485	475	475	460	455	450	450	450	450	450	450	450	450	425	425	410	400	400	390	380	380	375	375	447.25	
E.Godavari	472	474	476	476	473	473	473	473	473	473	473	463	459	449	449	449	449	445	435	435	420	420	407	407	395	383	383	375	375	365	365	433.7	
Hyderabad	464	466	466	466	466	450	440	440	442	442	432	432	415	405	405	405	408	408	395	395	382	382	370	370	360	360	350	350	353	355	355	405.41	
Ludhiana	484	484	484	484	477	466	459	454	451	447	444	-	-	-	-	419	422	422	422	413	403	397	389	371	364	355	355	355	355	-	423.04		
Midnapur (KOL)	522	524	525	525	525	525	525	525	525	525	525	520	520	506	496	496	496	485	480	480	474	474	462	454	454	440	430	424	424	414	400	484.77	
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mumbai (CC)	517	519	521	521	521	521	505	495	497	497	487	487	487	470	460	460	460	465	465	465	450	450	440	430	425	415	415	415	415	415	417	417	468.03
Muzaffarpur (CC)	543	538	538	528	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	449.23
Mysuru	487	489	489	489	480	475	470	470	472	472	465	445	435	435	435	435	435	435	435	425	425	425	425	425	410	410	400	390	394	394	440	440	
Nagpur	475	480	482	480	460	455	455	455	450	450	445	430	420	420	420	420	420	415	415	415	415	415	415	415	415	415	410	410	410	410	410	410	415.06
Namakkal	448	453	453	443	443	428	428	431	433	433	410	395	395	395	395	395	395	395	395	395	395	395	395	380	380	365	365	355	355	360	-	402.1	
Patna	543	543	538	538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	450.41
Patna (CC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pune	517	517	519	519	519	519	510	500	500	500	490	490	490	480	470	460	462	465	465	465	455	445	435	425	425	425	425	425	425	415	415	417	469.25
Ranchi (CC)	548	548	548	538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	470
Vijayawada	472	474	476	476	473	473	473	473	473	473	463	459	449	449	449	445	445	435	435	435	420	420	407	407	395	383	383	375	375	365	365	433.7	
Vizag	486	487	488	488	488	488	488	488	488	488	488	488	488	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	452.19
W.Godavari	472	474	476	476	473	473	473	473	473	473	473	463	459	449	449	449	445	435	435	420	420	420	407	407	395	383	383	375	375	365	365	433.7	
Warangal	465	467	469	469	453	453	443	443	445	445	445	435	435	418	408	408	408	408	411	411	398	398	385	385	373	373	363	353	353	358	358	411.35	
	Prevailing Prices																																
Allahabad (CC)	523	523	514	509	495	495	495	495	505	505	495	486	471	471	462	452	452	452	443	438	428	428	409	409	405	400	395	390	381	386	386	454.77	
Bhopal	500	502	503	505	485	485	485	485	475	465	455	455	445	445	445	445	445	445	445	445	445	445	445	445	445	445	445	445	445	445	445	445	447.12
Hospet	448	450	450	450	440	440	430	430	432	432	432	415	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	402.06
Indore (CC)	480	500	500	500	490	490	480	475	475	475	465	455	445	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440.48
Jabalpur	492	493	493	490	487	472	472	472	472	472	465	465	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	440.06
Kanpur (CC)	519	519	519	514	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	430.23
Kolkata (CC)	510	511	514	514	514	514	514	514	514	514	514	514	496	480	480	480	468	468	468	468	468	468	468	468	468	468	468	468	468	468	468	468	466.9
Luknow (CC)	543	550	550	550	550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	476.17
Raipur	510	512	512	512	512	512	512	512	512	512	512	490	490	470	460	460	460	463	463	463	440	425	425	425	425	425	425	425	425	425	425	425	459.7
Surat	520	523	525	525	525	525	510	510	512	512	512	500	500	485	485	485	485	485	485	485	485	485	485	485	485	485	485	485	485	485	485	485	482.77
Varanasi (CC)	537	537	524	537	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	460.58

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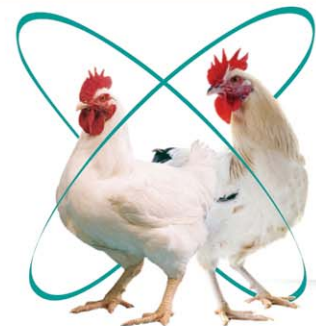
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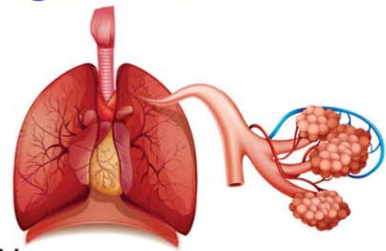
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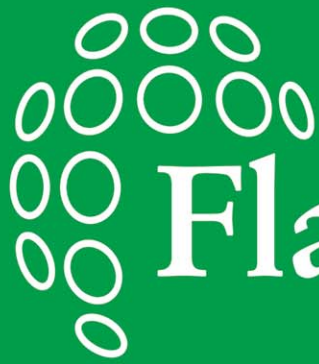
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Application :

APPLICATION	DOSAGE	DIRECTIONS FOR USE	METHOD
Fumigation of farms, hatcheries, incubators	1gm per 10 cu.ft. or 1gm per sq.ft.	Doors, windows and other openings should be closed. Place ENCIFORM-RM on a metal plate. Switch on the hot plate and leave the room. Allow sufficient time for the gas to be liberated. Retain the liberated gas for a reasonable time (best overnight) and then ventilate completely. Recommended rate of fumigation - 500 gms. in 30 minutes	
Chick nest pots	A pinch	Just put into the nest box.	
Litter disinfection	320 gms for every 1000 sq.ft. area	Sprinkle/mix with litter before placement of chicks. Repeat every 10 days even in presence of birds.	
Pit management	1000 gms in every 100 sq. ft. area	Sprinkle in to the pit to get about 1/4" layer before placement of dead birds. Then sprinkle liberally on top of the dead birds.	

Unique Advantages :

1. Lethal to all bacteria, molds and virus
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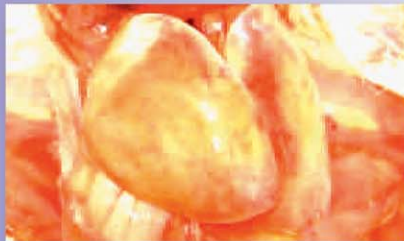
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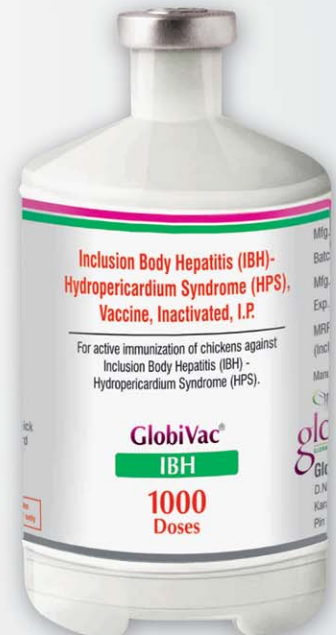


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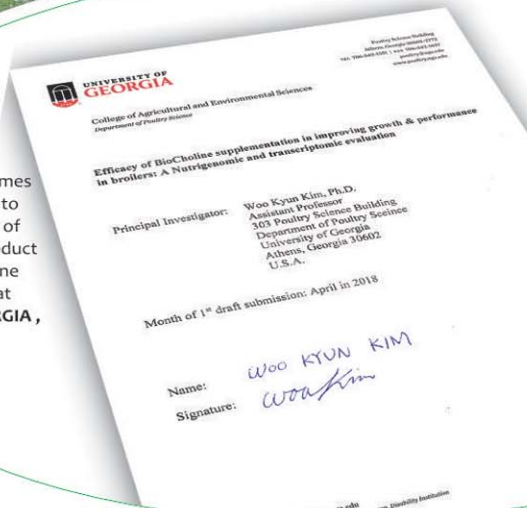
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✓ BioCholine leads to gene expression of enzymes of lipogenic / lipidomic pathway
✓ BioCholine stimulates hepatic mobilization of FFA to adipose tissue from liver and therefore prevents their deposition in liver
✓ BioCholine leads to gene expression of enzymes of glucose metabolic pathway
✓ BioCholine at lower dose in comparison to synthetic choline ensures significant improvement in overall performance in broilers (increment in mean final body weight by 7.2%)
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PRESENTATION

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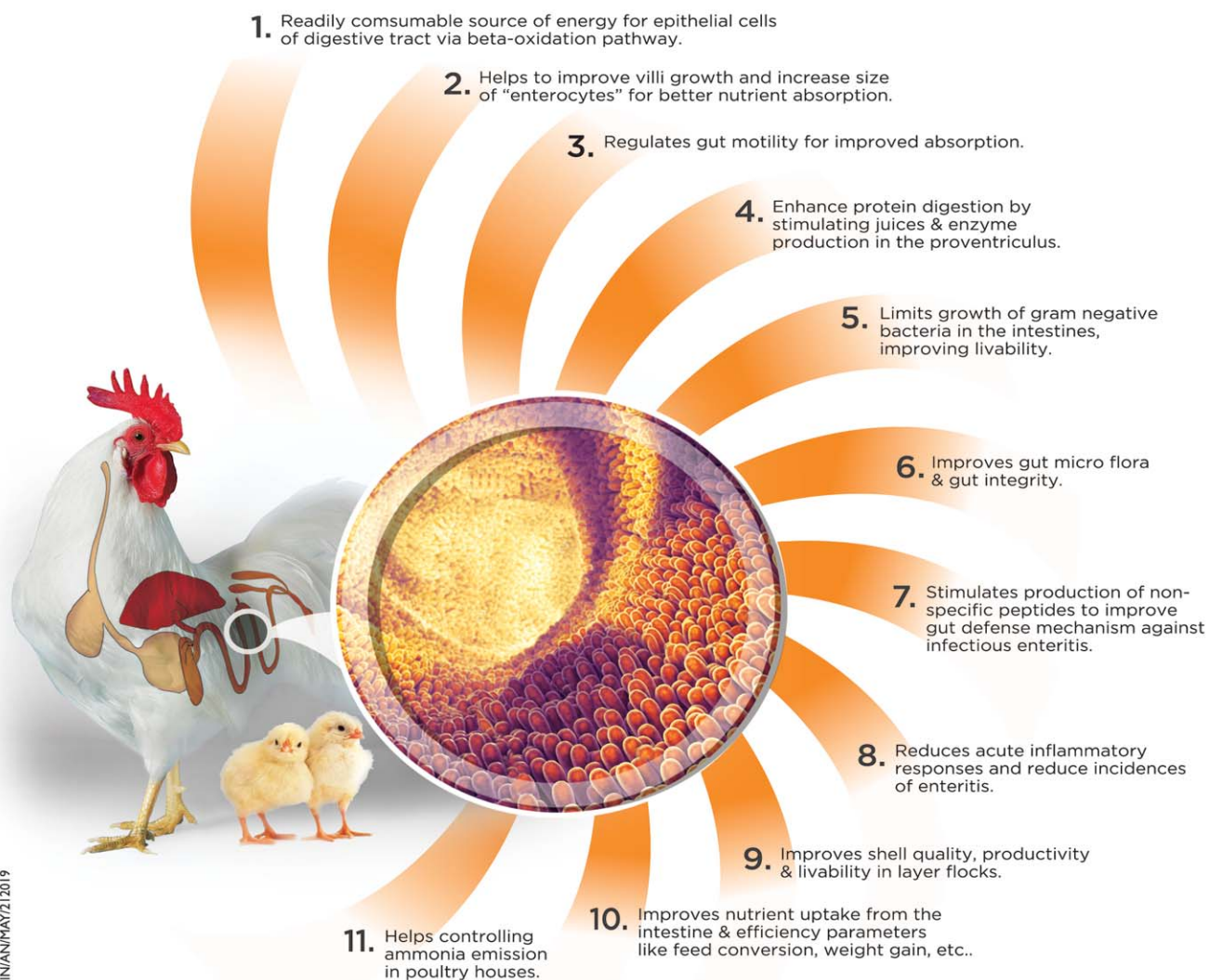
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Wet Droppings or Diarrhea

Wet droppings or chicken diarrhea are an early warning sign of intestinal distress that can provide a producer an invaluable insight into the overall gut health of their birds.

The normal intestinal transit time of commercial poultry is fairly fast, only about 4-8 hours, thus serious situations can arise very quickly. Moreover, wet litter is associated with numerous concerns including animal welfare issues such as contact or footpad dermatitis and reduced air quality due to increased ammonia concentrations. (Read [5 tips to successfully manage poultry house ammonia levels](#)).

Wet litter could also present a food safety concern as it provides an ideal environment for bacterial growth.

Diarrhea can often be a complex issue as it can be caused by a variety of means including both non-pathogenic and pathogenic agents. Due diligence on behalf of the producer is necessary to identify the underlying cause of the disturbance and take corrective actions as soon as possible in order to return to optimal gut health.



Management Causes

Excessive water intake has a direct correlation with the incidence of wet droppings. High temperatures

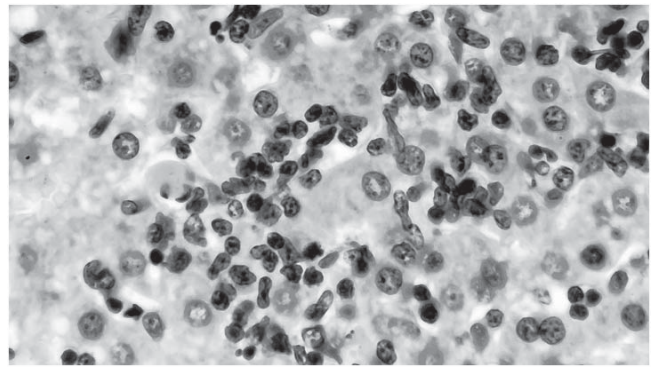
and humidity within the house can lead to heat stress in birds and cause them to drink more and eat less in attempts to regulate their body temperature. Moreover, heat stress has been shown to impair intestinal integrity and lead to a leaky and inflamed gut. Compromised gut integrity will reduce net water absorption from the intestinal tract, thus resulting in watery excreta; alternatively, excess nutrients will increase renal outputs of water.

Nutritional Causes

High intake of the minerals potassium, magnesium, sodium, sulfate, or chloride through the feed or water can cause increased water consumption as birds try to maintain their electrolyte balance, thus leading to wet droppings. Feed levels of salt should be evaluated to insure that a mixing error has not occurred and mineral concentrations in the water should be tested regularly. Poor quality or rancid fat can also lead to diarrhea. Additionally, certain feed ingredients, particularly those high in Non-Starch Polysaccharides (NSP) such as wheat, barley, and rye, are often associated with incidence of wetter and more viscous excreta as these components trap water and prevent it from being reabsorbed. For diets high in these feed ingredients, it is common practice to use commercially available NSP-degrading enzyme preparations.

Mycotoxins

Moldy feed or feed ingredients can also be a source of mycotoxins. Mycotoxins – toxic fungal metabolites produced by common molds found in many components of poultry diets— can directly reduce gut integrity, thus leading to decreased absorption and digestion of dietary nutrients and increased intestinal barrier permeability, which in turn can lead to wet litter. Furthermore, some mycotoxins, like ochratoxins, can cause damage to the kidneys and lead to increased diuresis.



Pathogenic Causes

Coccidiosis, caused by protozoan parasites of the genus *Eimeria*, is the most frequently cited disease associated with increased incidence of diarrhea. Coccidial infection, resulting either from natural disease outbreak or from introduction at low levels through live coccidiosis vaccination, can damage the intestinal epithelium, allowing the leakage into the intestinal lumen. Moreover, the leakage of plasma proteins can provide a rich nutrient substrate that *Clostridium perfringens* can exploit for proliferation and toxin production, hence leading to necrotic enteritis.

Bacterial diarrhea or dysbacteriosis, a non-specific bacterial enteritis, is another highly cited cause of wet excreta. Dysbacteriosis is an imbalance of the intestinal microbiota caused by several non-infectious and infectious factors such as high inclusion of NSP in the diet, coccidia, and *C. perfringens*. Dysbacteriosis may also be a result of an abrupt change in feed or other stress factors,

which upset the usual microbial balance in the intestine.

Pathogenic bacteria, like *Escherichia coli*, *Campylobacter jejuni*, and *spirochaetes*, as well as several viruses, such as adenovirus, coronavirus, reovirus and rotavirus are known to have been implicated as a causative agent of diarrhea.

Conclusion

- Diarrhea is a common occurrence in the poultry industry that can provide valuable insight into the overall health of the bird.
- Wet droppings are a sign that the gut is not able to work at full efficiency and feed conversion and thus profits are not where they could be. Determining the underlying cause of wet droppings can often be multi-factorial and complicated, but uncovering these issues and implementing a targeted mitigation strategy will foster a quick return to optimal gut health, which will ultimately pay dividends in the long run.

M.A. Waheed



S.S. Associates

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Biomin makes strong impact at Poultry India Expo



By bringing in its experts at the booth to provide services and solutions to the customers, BIOMIN made a strong impact at the 13th edition of Poultry India Expo held at Hyderabad.

31 December 2019 – From productive discussions with BIOMIN experts to an engaging fun activity, BIOMIN booth at Poultry India expo was bustling with lot of activities this year. The three-day international expo held at Hitex Exhibition Complex in Hyderabad from November 27 to 29 provided an ideal platform for the innovative animal nutrition company to meet customers and potential customers from south Asia.

The presence of BIOMIN experts: Poultry Technical Manager Andrew Robertson, Regional Product Manager - Animal Nutrition Lesley Nernberg, and Technical Sales Manager - Poultry Gangga

Widyanugraha added value to the customers and visitors.

Display of models depicting the Duplex Capsule structure of Digestarom® DC and molecular structure of mycotoxins at the booth facilitated the visitors in getting a better understanding of the BIOMIN products and its mode of action.

“Poultry India 2019 is one of the best events for BIOMIN in India and we are glad we were able to make a vibrant presence here with lot of customer engaging activities,” Asia-Pacific Regional Director Edward Manchester said and added that BIOMIN is focusing on helping the industry to optimize feed performance.

During the expo, customers got an overview of Spectrum Top® 50, the mycotoxin detection service from BIOMIN and the mode of action of Mycofix® portfolio of feed additives.





Andrew Robertson in his comments observed that huge opportunities are ahead for BIOMIN in Indian subcontinent. "It is very encouraging to interact with the customers and visitors here, who are showing a great level of interest in improving feed efficiency and animal performance through phyto-genic feed additives," he said.

The golf activity hosted at the booth by BIOMIN was thoroughly engaging and entertaining for the customers and became an immediate hit.

"We are delighted to see the happy customers trying their hand at the putting greens and those



who putted won a prize,"RajanSeralathan, Strategic Process & Marketing Director, BIOMIN India said and added that there were also repeat visitors who wanted to try again.

To create awareness on the BIOMIN products and services, the entire BIOMIN team observed 'PoultryStar Day' and 'Mycofix Day' on November 27 and 28 respectively by wearing the badges.

Alongside Indian customers, industry stakeholders and business partners from Sri Lanka, Nepal, Bhutan, and Bangladesh also visited the BIOMIN booth.





ANNOUNCING

National Conference and Seminar by WVPA(India) **Advances in Poultry Science for One Health**



Venue: ICAR-NIANP, Bangalore

Date: 28th Feb, 2020

Speakers- International & eminent experts from India

World Veterinary Poultry Association (India)

The World Veterinary Poultry Association is a global professional association for poultry veterinarians and other avian health professionals.

The Objectives of the Association are:

- To organise meetings for studying diseases and conditions relating to the avian species
- To encourage research in this field
- To promote the exchange of information and material for study between individuals and organisations in the avian species
- To establish and maintain liaison with other bodies with related interests

Registration Details:	Online Registration	On-site Registration
	16 th Jan to 28 th Feb, 2020	28 th Feb, 2020
Students	₹ 800	₹ 1000
WVPA Members	₹ 1200	₹ 1500
Non Members	₹ 2000	₹ 2500

Participants:

- Students related to Poultry Research and Management
- WVPA Members
- Poultry Professionals and related to the poultry industry

For more details, please login to www.wvpa.in
www.wvpaindiaconference.com

Posters:

- Numbers of Posters to be accepted: 100
- Travel grant for Students: [if abstract is accepted], by sleeper class Railway Ticket + Registration and Accommodation
- Awards and Recognition for top 20 abstracts based on quality of research
- Last date for submission of Abstract: **15 February 2020**

Annual Membership Fee: ₹ 2500/-

Life Membership [on invitations based on contribution and involvement]



New Fermentation Plant Worth 150 Million Euro from Biovet and Huvepharma opens its doors in Bulgaria

The new fermentation plant from Biovet officially opened its doors recently. The overall investment adds up to 150 million euro made over a period of less than 2 years.

The company is part of the **Huvepharma** Group, the leading European producer in feed additives, enzymes, probiotics and API's for industrial animal husbandry.

The Bulgarian company Huvepharma is a global pharmaceutical leader, focused on the production of humanitarian and veterinary medicaments, successfully offering its products in more than 100 countries worldwide.

For the official opening ceremony, in attendance were, the Prime Minister of the Republic of Bulgaria, Mr. Boyko Borisov, the Minister of Economy, Mr. Emil Karanikolov, the Minister of Finance, Mr. Vladislav Goranov, the Minister of Environment and Water, Mr. Neno Dimov, the Chairman of the Energy Committee in the 44th National Assembly, Mr. Valentin Nikolov, Mayor of Peshtera Municipality, Mr. Nikolay Zaichev, Regional Governor, Stefan Mirev and many representatives from the central and local authorities.

This project is part of the Huvepharma growth strategy, as a pharmaceutical company based in the European Union, operating on a global scale. The support of EIB, gave the company the opportunity to speed up its investments in Bulgarian production and scientific research and development, thus concreting the plans for further developing a fully integrated company with production facilities located in the European Union with sales on global markets.

The new Fermentation plant is designed and built based on the company's more than 60 years traditions, experience, knowledge, adhering to all the principles of versatility and flexibility, using state-

of-the-art equipment and technologies, and applying industry best practices and techniques.

The project was completed on green field, within 22 months and includes: a fermentation capacity of 3,500 m³ and workshops for processing and formulation of the products.

The complete energy system for the power supply includes electrical substation, production of steam and compressed air as well as the production of technical and cooling water.

Huvepharma SEA (Pune) Pvt. Ltd. takes pride in being a part of this global growth story. Huvepharma EOOD has been keen on investing their time and technology in India. Huvepharma SEA has been instrumental in launching Huvepharma's product ranges from time to time. The past couple of years have seen India emerging as one of the first markets to launch many new products from the Huvepharma stable which are unique and with high potential.

Our latest offering to the Indian subcontinent region, such as Hygiene and Disinfection range for biosecurity at various stages in poultry, dairy as well as aqua, Dietics range for poultry, Performance boosters and Rumen modifiers for dairy, Intermediates for human medicines etc., are aimed at providing top quality, globally accepted, critically evaluated and regulatory certified products to the market to ensure food safety, traceability and boost customer profits.

Reinforcing strong ties between India and Bulgaria, Mr. O.P. Singh, Managing Director, Huvepharma SEA recently had the opportunity to discuss various business issues at The Taj Palace Hotel, New Delhi and interact with the Hon'ble Deputy Prime Minister of Bulgaria for Economic and Demographic Policy, Mrs. Mariyana Nikolova, and the trade delegation that she headed on this visit to India, which

included Deputy Minister of Tourism, Mr. Lyuben Kanchev, Executive Director of Bulgarian Small and Medium Enterprises Promotion Agency, Dr. Boyko Takov, President of Bulgarian Chamber of Commerce and Industry, Mr. Tsvetan Simeonov, apart from The Ambassador of the Republic of Bulgaria to India, H.E. Mrs. Eleonora Dimitrova and Minister Plenipotentiary, Head of Trade and Economic Affairs, Embassy of the Republic of Bulgaria to India, Mr. Iliya Dekov.

Hon'ble Dy. Prime Minister Mrs. Nikolova was in India with the aim of identifying new initiatives and establish partnerships to further strengthen links between Bulgaria and India. It is notable that

Huvepharma is also the largest Bulgarian business partner with India.

Speaking on the occasion, Mr. Singh expressed pleasure and gratitude to the Hon'ble Dy. Prime Minister for the Bulgarian Government's continued support and encouragement to the Huvepharma Group in its endeavor to upgrade and expand the production, research and testing facilities which bear a direct impact on the large animal health industry spread across the world. In his address to the esteemed gathering, he said "Food safety and qualitative food production must be supported with all scientific products and services for the Indian consumers ensuring emerging paradigm can be met".



(L to R) **Mr. Tsvetan Simeonov, President of Bulgarian Chamber of Commerce and Industry, Dr. Boyko Takov, Executive Director of Bulgarian Small and Medium Enterprises Promotion Agency, Her Excellency Mrs. Eleonora Dimitrova, Ambassador of Bulgaria to India, Mr. Lyuben Kanchev, Deputy Minister of Tourism, Mrs. Mariyana Nikolova, Hon'ble Deputy Prime Minister of Bulgaria for Economic and Demographic Policy, Mr. O.P. Singh, Managing Director, Huvepharma SEA.**

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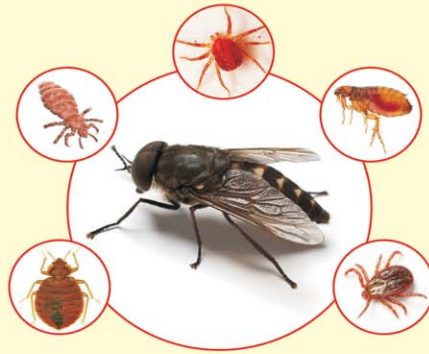
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* D. Michael Fry - Department of Avian Sciences, University of California, Davis, California - Environ Health Perspect 103(Suppl 7):165-171 (1995)



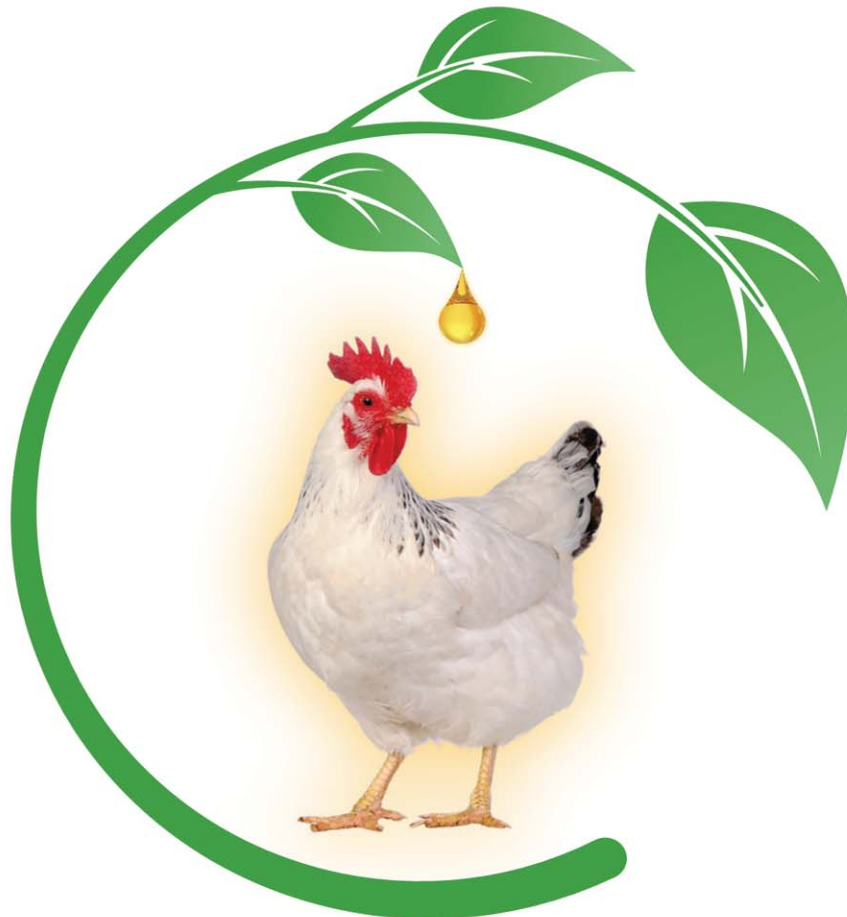
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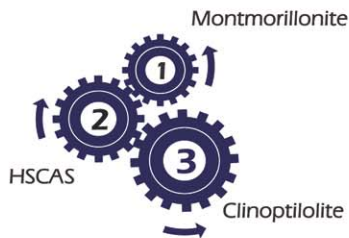
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Essential oils and their benefits in poultry

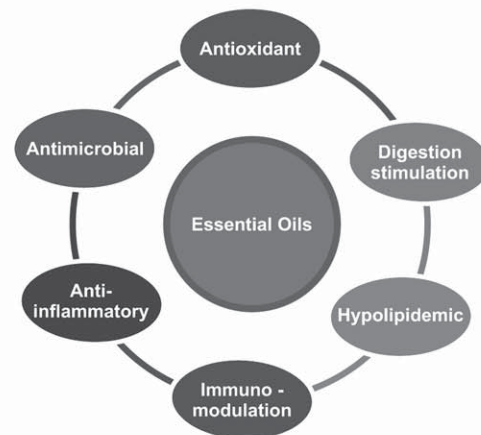
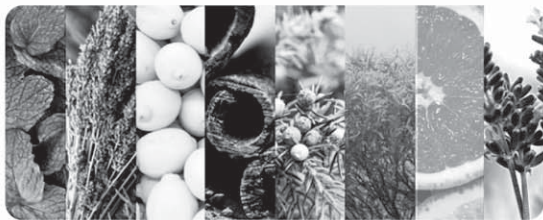


Fig. 1. Actions of essential oils

INTRODUCTION

Resistance of pathogenic bacteria to commonly used anti-microbials has forced the poultry industry to explore alternative solutions like prebiotics, probiotics, organic acids, bacteriophages, anti-microbial peptides, lysozymes, lactoferrins, phytochemicals / essential oils (EOs), etc.



One of the safest and efficient alternatives is essential oils, also called as zoo-technical additives. Essential oils are less toxic and typically more residue-free compared to synthetic antibiotics, thereby ensuring animal welfare and food safety. Recently, use of essential oils along with short chain fatty acids (SCFAs) in broilers, layers and breeders has gained importance.

OVERVIEW OF ESSENTIAL OILS

The term “essential” does not mean that these are essential (Oyen and Dung, 1999) but denotes the essence (flavour) they obtain from different parts of the plants like root, stem, bark, fruit, flower, etc. Currently, there are over 3,000 known essential oils with approximately 300 being commercially relevant (Diaz-Sanchez *et al.*, 2015).

Quality of essential oils depends on environmental condition, climate, harvesting time, part of the plant, soil type and extraction method. Essential oils can be obtained through various methods like fermentation, extraction or expression but most common method is steam distillation (Raut and Karuppaiyl, 2014).

Essential oils are a mixture of fragrant and volatile compounds, sensitive to heat and light and are chemically comprised of two major classes, namely terpenes and phenylpropenes (Cooke *et al.*, 1998).

Essential oil constituents are quickly absorbed after oral administration and are either metabolized or eliminated by the kidneys in the form of glucuronides or exhaled as CO₂. Their accumulation in the body is unlikely due to rapid clearance and short half-lives (Lee *et al.*, 2004). Essential oils are found to have antibacterial, antifungal, antiviral and also exhibit antioxidant, anti-inflammatory, anti-carcinogenic, digestion stimulating & hypolipidemic activities (Viuda-Martos *et al.*, 2010). Besides, other beneficial effects of essential oils include appetite stimulation, improvement of endogenous digestive enzyme secretion and immune response activation.

Recently, essential oils along with SCFAs are used to improve body weight gain, feed conversion, egg production and disease resistance in poultry. As essential oils are highly reactive and possess strong odour & taste, they need to undergo micro-encapsulation process which will help them in sustaining pelleting temperature and increasing their shelf life.

PROPERTIES & ACTIVITIES

Antimicrobial activity

Antibacterial activity is not an outcome of a specific mode of action but it is a cumulative effect of various mechanisms which are dependent on pH, chemical structure, presence of functional groups (Farg *et al.*, 1989), dose of active ingredient and quorum of microbes (Burt, 2004). Essential oils are very effective against *Salmonella*, *E. coli*, *Clostridium* and other pathogenic bacteria, (Cosentino *et al.*, 1999) virus and fungi (Smith-Palmer *et al.*, 1998). Cinnamaldehyde, Carvacrol, Citral, Thymol and Eugenol exerts fair antibacterial effect (Dormans and Deans, 2000). Essential oils can potentially reduce the incidence of *Salmonella* in broiler carcasses and in the broiler house with a positive impact on food safety (Bento *et al.*, 2013).

Table 1. Actions of Essential Oil Components

Components	Mode of Action
Terpenoids & Phenolics	Bacterial Cell membrane disruption
Phenols & Flavonoids	Metal ion chelation
Alkaloids	Bacterial growth inhibition

(Cowan, 1999)

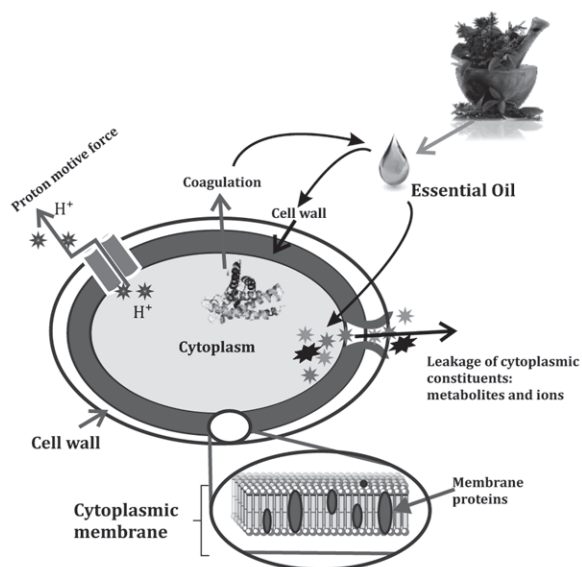


Fig. 2. Antimicrobial activity, by affecting different elements of the pathogen

Cinnamaldehyde exerts antifungal activity by acting on sulfhydryl groups (Kurita *et al.*, 1979) and inhibits fungal cell wall synthesis (Bang *et al.*, 2000) which is necessary for fungal growth. Microbes use quorum-sensing to orchestrate collective population behaviour including bio-film formation and/or virulence factors secretion which is dependent upon the production and release of specific chemicals / signals at a population-wide scale. Phytochemicals derived from medicinal plants of the Myrtaceae family like Clove, Guava, Eucalyptus (Musthafa *et al.*, 2017) and Cinnamaldehyde (Pande *et al.*, 2013) inhibit quorum sensing and overcome the increasing virulence factors of pathogenic bacteria.

Antiparasitic activity

Essential oils are potent botanical products which either interfere directly with parasitic metabolism or indirectly by enhancing the host immune response and antioxidant defence system for the effective control and eradication of parasitic invasion. They also help in reducing intestinal lesions and faecal oocyst shedding in the litter. Phenols have oocysticidal action, control coccidiosis infection (Williams, 1997) and endoparasites in the gut.

It has been suggested that EOs are an effective alternative to coccidiostats, on the basis of improvements in performance & significant reduction in the post infection faecal blood discharge. Carvacrol and Thymol have anti-coccidial action against *E. tenella* and mixed *Eimeria spp.* infection (Oviedo-Rondon, 2003).

Antioxidant property

Essential oils have an inherent ability to donate electrons to the free radicals produced during the process of lipid peroxidation (Fernandez-Panchon *et al.*, 2008). They increase the keeping quality of meat by attenuating oxidative injury and improving redox balance in blood, muscles and tissues. They also influence the in vivo antioxidant defence systems such as Superoxide dismutase and Glutathione peroxidase. Phenolic EOs have potent antioxidant activity than Vitamin E, Vitamin C & Vitamin A and improve the hepatic concentration of Coenzyme Q10 (Rice-Evans *et al.*, 1997). Thymol, Carvacrol and other essential oils can act as antioxidants in egg and meat of chickens when introduced in the diets (Lee *et al.*, 2004). Supplementation of Carvacrol, Capsaicin and Cinnamaldehyde can increase the number of goblet cells and secretion of mucin on the surface of villi, providing better protection against invading infectious agents.

Stimulation of Digestion

Essential Oils improve digestion by stimulating secretion of bile, mucus and various digestive juices like trypsin, amylase and jejunal chyme (Manzanilla *et al.*, 2004). They significantly increase the villus width and surface area, indicative of improved nutrient absorption (Geyra *et al.*, 2001) and performance (Choct, 2009) and reduce the adherence of pathogens. Cinnamaldehyde helps to increase the bile secretion (Harada and Yano, 1975).

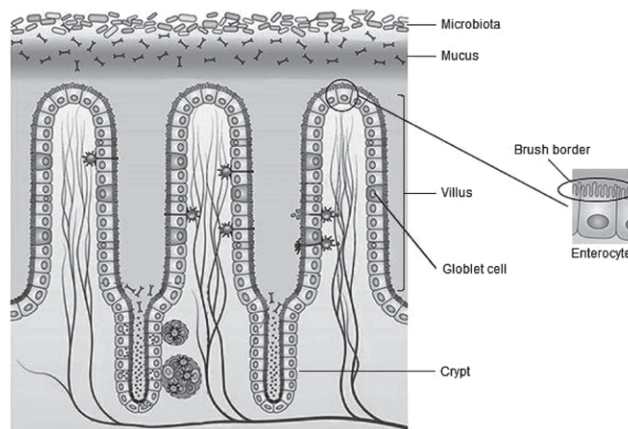


Fig. 3. Stimulation of digestion by improving villi and microvilli growth

Anti-inflammatory activity

Essential oils have been used traditionally for centuries to alleviate symptoms associated with eczema, dermatitis and other pronounced irritations (Kamatou and Viljoen, 2010). The major EO substances having anti-inflammatory abilities are the terpenoids and flavonoids. They suppress metabolism of inflammatory prostaglandins and reduce inflammatory conditions (Craig, 2001). Other essential oils (eucalyptus, rosemary, lavender, millefolia) and other plants (pine, clove and myrrh) have been used in mixed formulations as anti-inflammatory agents (Darsham and Doreswamug, 2004). They contain phenolic compounds that are known to possess strong anti-inflammatory properties. These substances suppress the metabolism of inflammatory prostaglandins.

Lipid metabolism

The hypolipidemic effect of essential oils is carried out through the inhibition of HMG-CoA reductase activity, a key regulatory enzyme in cholesterol synthesis (Crowell, 1999). Essential oils significantly reduce serum cholesterol level of broilers (Gopi *et al.*, 2012).

Immunomodulatory activity

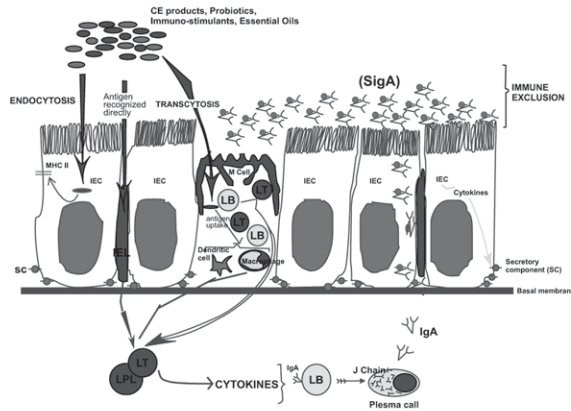


Fig. 4. Immunomodulatory activity of Essential Oils

This activity is a result of optimizing production of interleukins, γ interferons and $\text{TNF } \alpha$. Essential oils increase phagocytic activity of macrophages and Antigen Presenting Cells (APC) (Hanieh *et al.*, 2010). Another mode of improving immunity is through increasing weight and activity of immune organs like bursa of Fabricius and spleen (Rahimi *et al.*, 2011).

There will be an increase in IgG, IgA, IgM, CD3 and CD4 serum levels and ND titre values when birds are provided with essential oils (Rezaei-Moghadam *et al.*, 2012). It is well known that many diseases, that have immunomodulated components, can be treated by administration of biological compounds that activate key pathways in the immune system. They strengthen the defence and immune mechanisms of the body and can be used for stimulating the non-specific immune response (Awaad *et al.*, 1999).

Positive effect on gut microbiota

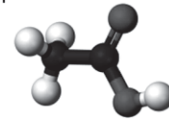
Many essential oils stimulate growth of beneficial microbes and reduce the number of pathogenic bacteria in gut (Wenk, 2000). Similarly, Capsaicin, Carvacrol and Cinnamaldehyde will have a positive impact on gut microbiota and growth performance (Jamroz *et al.*, 2005). Activity of intestinal microbiota leads to synthesis of SCFAs as a result of digestion of indigestible fibre which provides additional source of energy for the host (Li *et al.*, 2012). Essential oils also increase the proportion of SCFAs, butyrate in the caecum which is known to provide energy to colonic mucosa (Roediger, 1980) and thus have potentially important implications for intestinal immunity (Hamer *et al.*, 2008).

Effect on Growth Performance

Dietary essential oils may act not only on intestinal microflora, but also on nutrient utilization (Bento *et al.*, 2013) in broilers, layers and breeders. Essential oils improve growth performance by stimulating the secretion of digestive enzymes leading to improved nutrient digestion, rate of gut passage or feed intake (Jamroz *et al.*, 2005).

SHORT CHAIN FATTY ACIDS

Short chain fatty acids (SCFA) with sodium, potassium and calcium salts are commonly used for controlling susceptible pathogenic bacteria particularly gram negative ones. Butyric, propionic, formic and acetic acids are commonly used SCFAs in poultry for performance elevation. Salts / uncoated SCFAs will get neutralized easily in the foregut and very less antibacterial activity will be retained due to their dissociation but gut acidification will be taken care to some extent.



Coated or esterified SCFAs / organic acids are used which are more resistant against being neutralized in the foregut and provide good action in the hind gut against susceptible bacteria but acid available in undissociated form in the hind gut is highly variable. The use of organic acids has been reported to protect the young chicks by competitive exclusion (Mansoub *et al.*, 2011), enhancement of nutrient utilization, growth, feed conversion efficiency, immunity and performance in broiler and laying hens (Luckstadt and Mellor, 2011). SCFAs are also involved in prevention of diarrhoea (water and Na^+ absorption), pH control within the gastrointestinal tract, and defence against pathogens (colonization resistance). SCFAs are helpful in decreasing intestinal *E. coli* and *Salmonella spp.* (Hassan *et al.*, 2010).

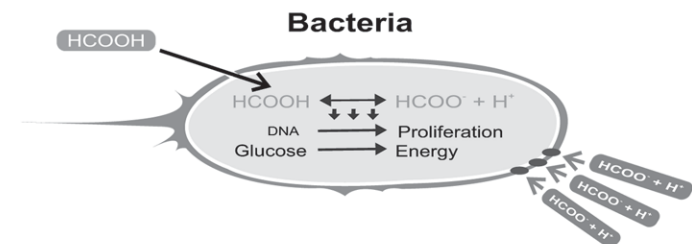


Fig. 5. Mode of action of short chain fatty acids / organic acids

It has been shown that SCFAs inhibit the growth of *Salmonella* (Van Immerseel *et al.*, 2003), *Aspergillus* (M.A. Coaker *et al.*, 2006) and *Penicillium* (Mariko ERA, 2015). SCFAs reduce cytoplasmic pH and stop metabolic activities of susceptible bacteria. SCFAs will cause death of susceptible organisms by acting on cytoplasmic membrane by neutralizing its electrochemical potential and increasing its permeability. Once hydrogen ion is injected through the lipopolysaccharide layer on the cell wall of susceptible bacteria, pH of intracellular contents will be reduced and this process consumes a great amount of energy to maintain intracellular homeostasis and causes bacterial cell death. SCFAs will improve gut health by reducing damage of intestinal cells by pathogenic bacteria and improve birds' performance in terms of body weight gain, FCR, maintain egg production, reduce egg shell contamination, and reduce litter contamination in broiler, layer and breeders.

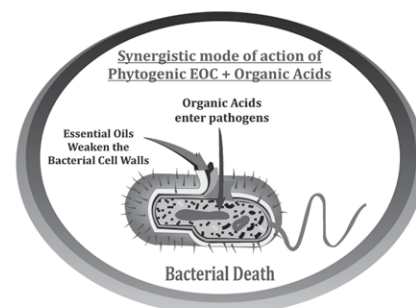


Fig. 6. Synergistic action of Essential oils and short chain fatty acids

MEDICINAL ACTIVITY OF COMMONLY USED HERBS AS EO_s

Name of the Herb	Major Active Ingredient	Medicinal Property	Reference
Oregano <i>Origanum vulgare</i>	Carvacrol & Thymol	Anti-bacterial, anti-fungal, anti-parasitic, anti-viral, anti-inflammatory, immuno-stimulant, hepatoprotectant and anti-oxidant activity	Joseph Nordqvist, 2017
Cinnamon <i>Cinnamomum verum</i>	Cinnamaldehyde	Immuno-modulatory, anti-oxidant, anti-viral, anti-microbial, lipid-lowering, anti-inflammatory, anti-tumor, gastroprotective, neuroprotective and blood purifying properties.	Steiner, 2010; Toghyani <i>et al.</i> , 2011
Clove <i>Syzygium aromaticum</i>	Eugenol	Anti-microbial, anti-fungal, anti-inflammatory, anti-carcinogenic, anti-parasitic and anti-oxidant effects	Mitsch <i>et al.</i> , 2004; Kamel, 2001
Eucalyptus <i>Eucalyptus globulus</i>	Cineole	Anti-microbial, anti-viral, expectorant, decongestant, mucolytic, immuno-modulatory and activity against heat stress	Farhadi <i>et al.</i> , 2016
Capsicum <i>Capsicum frutescens</i>	Capsaicin	Improves stimulation of pancreatic, intestinal enzymes and bile acid secretion	Abdel Salam <i>et al.</i> , 2005; Platel and Srinivasan, 2004,
Ginger <i>Zingiber officinale</i>	Gingerol	Digestion stimulation, anti-oxidant, anti-microbial and immune stimulation	Morakinyo <i>et al.</i> , 2011
Pepper <i>Piper nigrum</i>	Piperine	Anti-microbial, anti-inflammatory, digestive stimulant, anti-oxidant, immune stimulant and hypolipidemic	Khalaf <i>et al.</i> , 2008; Mittal and Gupta, 2000; Reddy <i>et al.</i> , 2004
Garlic <i>Allium sativum</i>	Allicin	Anti-bacterial, anti-fungal, anti-parasitic, anti-viral, anti-oxidant, anti-cholesteremic, anti-carcinogenic and vasodilator characteristics	Hanieh <i>et al.</i> , 2011
Turmeric <i>Curcuma longa</i>	Curcumin	Anti-oxidant, anti-protozoal, anti-microbial, anti-inflammatory, anti-carcinogenic, liver health and immuno-modulatory	Amalraj <i>et al.</i> , 2017
Cumin <i>Cuminum cyminum</i>	Cuminaldehyde & Thymoquinone	Anti-inflammatory, anti-carcinogenic, immune stimulatory, gastroprotective, digestive stimulant, hepatoprotective, nephroprotective, and neuro-protective activities.	Srinivasan, 2018
Peppermint <i>Mentha x Piperita</i>	Menthol	Anti-coccidial, anti-stress, anti-microbial, insect-repellent, analgesic and anti-oxidant	Arab Ameri <i>et al.</i> , 2016

CONCLUSION

Controlling of gut pathogens can be done by using essential oils and its main purpose is to attain good gut health and keeping the stressor agents at bay. Synergistic effect of essential oils with SCFAs will exert broad spectrum antimicrobial effect and help in reducing clinical and sub clinical infections caused by Salmonella, *E. coli*, Staphylococci and Clostridium in the gut as well as systemically. In broilers, it helps in improving bird performance, health status, immunity and feed conversion. In layers and breeders, it is employed for improving egg production and egg quality, health status of birds, feed efficiency, immunity and reduction in the percentage of cracked / broken eggs. Application of essential oils with SCFAs in the poultry diet could be used as antimicrobial, antioxidant, immuno-modulating and anti-inflammatory agents to produce low cholesterol meat, juicy and tender meat, fortified eggs and improved productivity with better survival rate.

Essential oils serve as an effective performance enhancer and an excellent alternative to AGPs due to their unique, traditionally used components like herbs / spices and thus play a huge role in the poultry industry development. The efficacy of any performance enhancer is partially dependent on other factors like effective rotation / shuttle programme of coccidiostats in feed, hence proper attention should be paid towards coccidiosis control programme. No agent is ideal unless proper management, feeding, brooding conditions, feed form (pelleted / mash), preventive vaccination and strict bio-security are maintained at farm level.

References are available on request.

Free Lance Poultry Consultant

DR.MANOJ SHUKLA, a renowned poultry Veterinarian, with 20 years of enriched field experience, now started Free Lance Poultry Consultancy. In the past 20 years have contributed to the development of the hatcheries in various capacities of leading companies across India - Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, Orissa, Bihar, West Bengal, Jharkhand, North-East, Uttar Pradesh and neighbouring country of Nepal.



His areas of expertise include:

- Commercial Layer Management.
- Commercial Broiler Management
- Nutrition (Feed Formulations).
- Breeder Management.
- Sales & Marketing of Day-Old commercial Layer chicks, Broiler chicks & Poultry Feed.
- Sales & Marketing of Broiler Breeder.
- Integration.
- Training to Field staff.
- Field Trial of Drugs & Feed additives.
- Speaker in Technical Seminars.

He can be Contacted at:- **Dr. Manoj Shukla**

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Mob.No : 09644233397, 07746013700, Res. 0771-4270230

Email : drmanu69@gmail.com

As a strategic partner, Poultry Line wishes Dr. Shukla every success in his new assignment

PRESS RELEASE

HEALTH & NUTRITION GO AND IN HAND

Show Preview – January 2020

Animals can only be productive if they are healthy. Hence, all conditions to grow must be excellent. Clean feed plants and farms with a high biosecurity status and precisely balanced rations to feed the animals. Strict veterinary control is needed to avoid incorrect or overuse of medication. That's a challenge.

The world's population is projected to reach 8.5 billion by 2030, 9.7 billion by 2050 and exceed 11 billion in 2100, with India expected to surpass China as the most populous country. At the same time, prosperity and buying power are slowly, but steadily on the rise. According to the Food and Agriculture Organization (FAO) of the United Nations, humans will start eating meat as soon as they gain spending power, usually over 5 USD per day. As a result, consumption of food from animal origin will gradually further increase around the globe and in Asia in particular. After all, the highest population density is currently on this continent.

Hence, a solid and healthy animal production sector will be of paramount importance, in order to meet this growing demand for food. Logically, that all starts with healthy and productive animals. After all, these are the key to provide the income for farmers and related parties. These parties have the tools together to minimize feed costs and obtain a solid income position at the production side of the "feed to food production chain".

Full control

From their early life, precise and well balanced feed formulation is a prerequisite for such healthy and productive animals. Proper ingredients and additives are the basis for energetic rich rations.

However, regular epidemics like Avian Influenza (AI) in poultry and currently African Swine Fever (ASF) in Asia, are a serious threat to the animal production business. The ASF epidemic has reached an enormous magnitude and the end doesn't seem to be near yet. Moreover, some so called zoonotic animal diseases, may directly transmit to and infect humans. A true danger. Culling such infected crops and herds is often the first measure to be taken. Apart from that however, adequate veterinary control is of great importance, including proper medical treatment.



Banning antibiotics

Up to the recent past, antibiotics were used abundantly to treat animals to a wide range of diseases. Not just that, antibiotics were also used as growth promoters in poultry and swine. In some parts of the world, that is even still common use. But the awareness that this is a serious danger, is steadily gaining ground. Antimicrobial Resistance (AMR) is a very serious threat to animal and human health and causes many casualties if nothing is done. As a result, many governments have adopted, or are in the process of adopting legislation to ban the unlimited use of antibiotics in animal production. Moreover, veterinarians are supposed to only prescribe antibiotics under strict conditions.

Proper solutions

In this context, biosecurity in feed plants and at farm level is of great importance to prevent new outbreaks of contagious diseases, which again may lead to enormous losses. Moreover, the use of new and innovative feed ingredients, enhancing the immune system of animals is widely promoted. Many of such products have been developed in the past years and new products are permanently under development. Such products have a positive impact on the health status of animals.

Health and nutrition of production animals go hand in hand

The launch of VICTAM and Animal Health and Nutrition Asia 2020 as a joint event combines under one roof the expertise of two show organizers, VICTAM and VIV, who made the summer headlines worldwide for a unique event in Asia.

Providing a total solution from feed production, feed technology and processing, to feed ingredients, feed additives, animal health and pharmaceuticals in animal protein production, **VICTAM and Animal Health and**

Nutrition Asia 2020 will open the doors on March 24 – 26, 2020 in Bangkok, Thailand, with around 400 exhibitors and a total of 17,800 square meter exhibition space at BITEC. In parallel with the exhibition, there is an extensive conference program available with specialized topics in the field of animal feed technology, animal nutrition and health. Exhibiting in one of the three show halls of VICTAM and Animal Health and Nutrition Asia, gives exhibitors access to the world's fastest growing market, Asia, and to a targeted audience of around 9,000 professional visitors including CEOs, feed formulators, mill managers, nutritionists, operation directors, veterinarians, academics, and many more.

"VICTAM & Animal Health & Nutrition Asia" is Asia's biggest animal protein trade show in 2020. In one place it displays machinery, feed additives, pharmaceuticals and more. 2020 is the year of our 20th anniversary. During the show, we will display the development of our company and products since our founding. We will also update our present products and announce upcoming innovative products", says *marketing manager, Piyamitr Muenprasertdee of Phytobiotics* "Kanters from The Netherlands, support animal health by the addition of liquid nutritional supplements, and ensure better animal welfare by reducing the use of antibiotics. Healthy Animals and Healthy Farms – that's what we stand for. Our participation in the show in Bangkok is clear: We wish to showcase our Health Concept and solutions to the audience in Asia, strengthen our relations and establish new contacts. We believe that

VICTAM & Animal Health & Nutrition Asia will be an excellent opportunity to reach that goal", says *CEO Rogier van Sambeek*.

VICTAM and Animal Health and Nutrition Asia offers a series of high quality industry conferences and technical seminars in the fields of animal feed technology, health and nutrition. From current trends and the future in aquafeed to sustainability in petfood to functionalities and nutritional aspects in insect proteins and antibiotic alternatives, there is a topic for everyone in the industry.

See full conference program at <http://preview.vivhealthandnutrition.nl/conferences/>

Pre-registration now open at <https://www.databadge.net/viah2020/reg/?card=30002393>

For more information, please visit

VIV: <https://vivhealthandnutrition.nl/?v=1> |

VICTAM: <https://victamasias.com/?v=1>

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Hyderabad	94	88	88	88	83	83	83	83	83	80	80	82	82	85	87	87	87	87	90	90	90	93	93	93	96	100	100	100	100	100	92
Karimnagar	94	88	88	88	83	83	83	83	83	80	80	82	82	85	87	87	87	87	90	90	90	93	93	93	96	100	100	100	100	100	92
Warangal	94	88	88	88	83	83	83	83	83	80	80	82	83	87	87	87	87	87	92	92	92	93	93	93	96	100	100	100	100	100	92
Mahaboobnagar	94	88	88	88	83	83	83	83	83	80	80	82	82	85	87	87	87	87	90	90	90	93	93	93	96	100	100	100	100	100	92
Kurnool	94	88	88	88	83	83	83	83	83	80	80	82	82	85	87	87	87	87	90	90	90	93	93	93	96	100	100	100	100	100	92
Vizag	87	92	92	92	82	82	85	88	88	90	90	92	92	95	97	97	97	97	100	100	100	102	102	102	102	105	105	105	100	100	93
Godavari	93	88	88	88	88	88	88	88	88	88	88	90	90	92	92	92	92	92	95	95	95	97	97	97	97	100	100	100	100	100	93
Vijayawada	96	96	93	93	93	93	93	93	93	91	91	92	92	94	94	94	94	94	96	96	96	98	98	98	98	100	100	100	98	98	95



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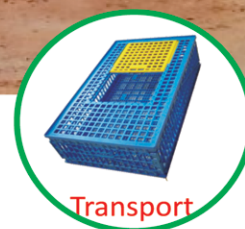
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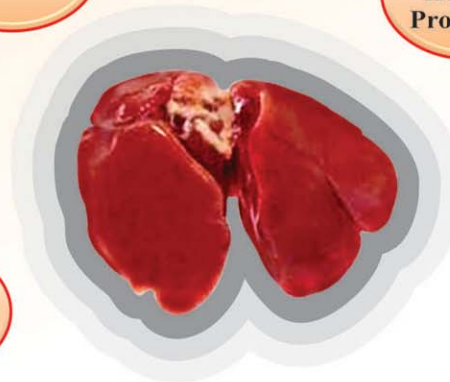
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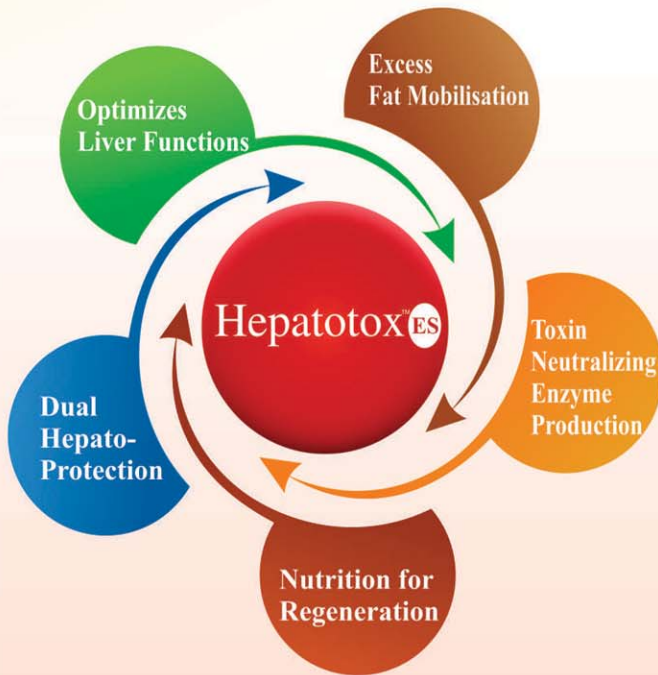
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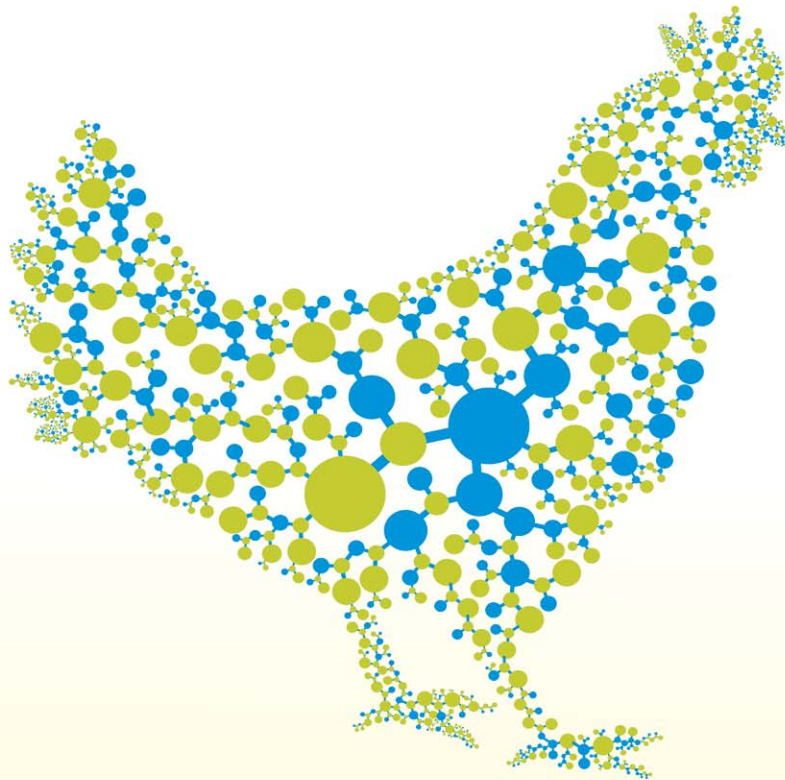
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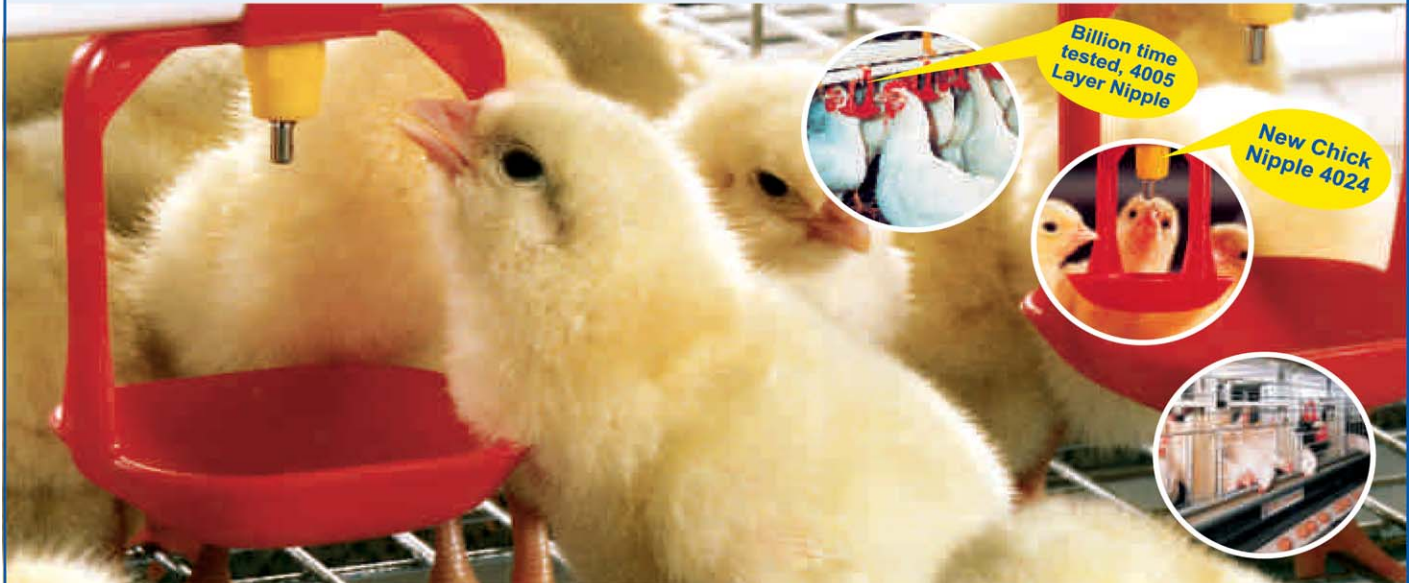
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PRESS RELEASE

Poultry Federation of India joins the 'Right to Protein' initiative

Foremost national-level organization will support the cause of adequate protein consumption in India

Mumbai, January 26, 2020: Poultry Federation of India partners with Right To Protein, a public initiative to increase awareness about adequate consumption of protein in our daily Indian diets. The association will further help Right To Protein to champion the cause to make right to adequate nutrition through protein sufficiency a foundational and basic right of the citizens of India.

The long-term goal of this partnership between Poultry Federation of India and Right To Protein is to drive national consciousness towards complete nutrition by making Indian households more aware of their daily protein requirements and encourage them to consume the required amount for overall improved health.

On this important development, **President of the Poultry Federation of India, Mr. Ramesh Khatri**, said "As an important voice for the poultry industry, one of our key objectives is to create awareness regarding the importance and urgency of adequate protein awareness and consumption in our highly protein deficient country. After learning about the Right To Protein initiative, we realized that our goals are similar and it is a great opportunity to collectively further the cause of protein awareness"

"We are confident that the Right To Protein initiative can create a significant impact across regions and demographics in India, by educating people and encouraging them to monitor their daily protein intake using their Protein-O-Meter tool and also maintain a fine balance of nutrition by following the Protein Index guide" added Mr. Khatri.

The Protein-O-Meter tool freely accessible on www.righttoprotein.com, calculates one's daily protein requirement basis basic individual information such as body profile, type of lifestyle and meals consumed at different times during the day. Apart from information on one's possible protein gap, the platform also provides information on protein-rich foods, healthy habits, tips and busting myths about protein.

The Right To Protein initiative aims to create a vibrant ecosystem of like-minded citizens that will not only sensitize each other about the importance of protein in an Indian diet, but will also further the country's public health agenda in-line with Government of India's campaigns such as Eat Right India. Regular information regarding protein, is shared through www.righttoprotein.com. Institutions can help by associating with Right To Protein as a supporter to the cause. This includes organizations, government agencies, educational and research organizations that are directly operating in the human food and animal feed industry. Anyone can join the initiative using **#RightToProtein** on Facebook, Twitter and Instagram.

About the Poultry Federation of India (PFI): The Poultry Federation of India (PFI), is a national level organization recognized by the Government of India as a foremost voice of the Indian poultry industry. Established in 1988, the Poultry Federation of India, has been constantly working and is committed towards the protection, welfare and the overall growth and development of the poultry sector. PFI

is also known to work towards the eradication of protein malnutrition in India.

About the 'Right To Protein' Initiative: Right To Protein is India's first communications and consumer advocacy initiative supported by several like-minded Indians, individuals, academicians, professionals and institutions and is also supported globally. In its initial phase, the initiative is open for all Indians who would like to join and/ or contribute to the campaign in any capacity including providing knowledge, technical support or as promotion partners. Further, this initiative will develop an ecosystem of professionals to drive protein awareness and debunk myths and misconceptions about protein as a critical macro-nutrient for human health. The ecosystem will also aim to improve quality and consistency of different types proteins

consumed in India and thereby lead to greater protein consumption by livestock, poultry and pisciculture/aquaculture (fish & shrimp farming).

For more information, visit the www.righttoprotein.com and follow @righttoprotein on Twitter, Facebook, and Instagram OR contact: contactus@righttoprotein.com

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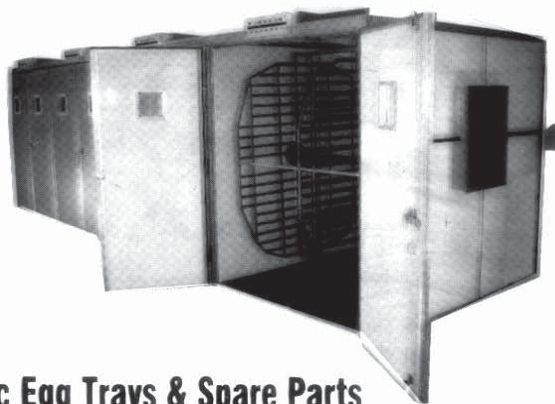


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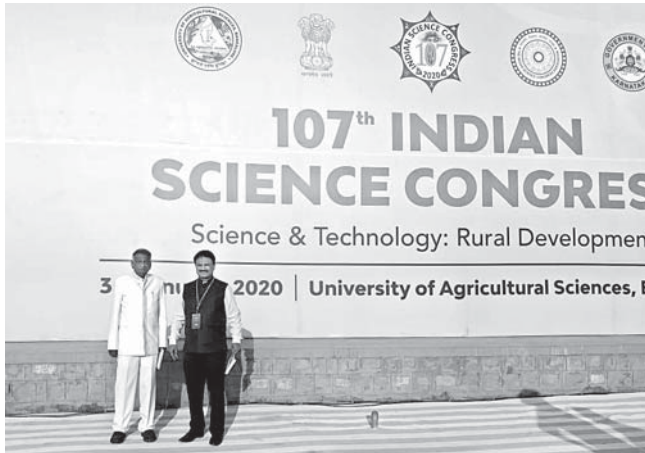
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PRESS RELEASE

Meeting human protein needs through poultry – an invited talk at 107th Indian Science Congress-2020, Bengaluru.



107th Indian Science Congress, an annual mega event was inaugurated by Hon'ble Prime Minister of India, Sri. Narendra Modi, on 3rd January, 2020 at Gandhi Krishi Vignana Kendra (GKVK) campus, University of Agricultural Sciences, Bengaluru.

Dr. Mahesh P.S. Director, CPDO&TI as an invited Speaker presented a talk at Indian Science Congress on the topic “**Meeting human Protein needs through Poultry**”. In this presentation, Dr. Mahesh elaborated on present context of Global Burgeoning population putting a stress on need of food for the large human population on the globe. It was narrated that Scientists should produce for the next 40 years which was being produced for the last 8,000 years of agriculture. The global population has spiked from 2 billion in 19th Century to almost 9 billion in the present century.

India with a three trillion economy, with young population of 65% touching 1.35 billion population is a growing economy with agri-based attractive markets. Indian Animal Husbandry sector poised for a sustained growth has been No. 1 in Milk production (119 MMT), No. 3 in egg production (90 billion eggs) and No. 5 in Chicken Meat production (4.5 MMTs) globally. The contribution from Animal Husbandry sector is estimated to be about 12 lakh

crores with poultry contributing nearly 1.2 lakh crores to the GDP.

Indian food habits over the years have gone for a paradigm change with a more focus on carbohydrate centric diet, making more than 70% population as protein-deficient. A slide depicting what India has ordered from a private food aggregator was shown. It was well established that 2 million orders were placed from a single online app per day. Interestingly, **Chicken Biryani topped as a most ordered food** along with Chicken Fried Rice and Mutton Biryani in the list of consumer preferences. This is an indication as a tip of the iceberg of increased focus on quick foods over planned diet.

Human body consists of 60% as water, 20% as fat and 20% as protein elements other than the trace minerals etc. An adult individual, as per the scientific recommendation is required to consume 0.8 – 1.0 gm per kilo body wt. as a mandatory daily protein requirement. However, most of the Indian diets are not suited to meet this. Dr. Mahesh in his presentation showed the diet of **Michael Phelps**, World Swimming Champion, **Usain Bolt**, the fastest man on the earth and **Hima Das**, the Golden



Girl of India making chicken and egg as their staple diet.

Chicken and Egg are products of poultry sector produced from agricultural products namely Corn and Soya. An egg weighing 50 – 55 gms would yield minimum of 6 gm protein as a complete protein supplement for an adult. Every 100 gm of egg (**2 eggs per day**) consumed could supplement **12.56 gm of protein daily**. Similarly every 100 gm of chicken (**2 chicken piece per day**) could supplement 18.6 gm of protein daily. As per the International Egg Commission, Egg is the only protein source with 97% protein true digestibility in the body.

During the talk, Dr. Mahesh narrated the egg consumption of Mexico (360+), Japan (340+), USA (270), UK (200), Iran (180) and India at 80 – 85 per capita egg consumption as of 2018 (Intl. egg commission). An interesting observation was also narrated about Bengaluru's daily egg requirement being **80 lakhs eggs per day** for the 1.2 crore population. A statement was made in this regard as **Bengaluru is USA in India** (270 eggs).

Further, Dr. Mahesh narrated Indian Poultry Sector producing 1.1 crores broilers per day and 26 crores eggs per day with an year on year growth of 8 – 10 percent in broilers and 4 – 6 percent in layers.



The trends in the market being broiler could attain 2 kilo body wt. at 32 days with an efficient FCR of 1.4 – 1.5, layer bird being an efficient producer of 330 eggs with a slim body wt. of 1.3 kilos annually.

In the presentation, the lessons from the other sectors were shown as an example for marketing poultry produce. The success of branding in Atta, Corn snacks, potato snacks, coffee, tea and the branding of Amul was well narrated. The trend-setters in the poultry sector



namely Licious, Fresh to Home, Nandu's, Happy Hen Farms, Suguna Fresh, Venky's Express etc., are the leading examples of success in marketing poultry produce.

The present day generation spends 2.5 hrs daily in Social Media and 1 hour 11 minutes in youtube as per the report in Economic Times. The Tik-Tok is the most downloaded app in the present times against youtube. Poultry sector need to catch this and create ads in these social media platforms. It was advised that. Poultry sector can focus on corporatization of sports other than cricket like Football, Badminton, Table Tennis etc., wherein chicken and egg are highly essential to meet the protein requirements of sports persons.

Poultry Sector is aggressive in these years by publishing ads which draw the attention of the consumer by putting full page ads in the leading news papers. The top iconic figures are also hired for branding and marketing. Veterinarians in Poultry (VIP), an association of veterinarians has set the trend of doing Eggchithon – Walkathon in various metros highlighting the benefits of egg and chicken. The suggestion was also made for use of Artificial Intelligence and Virtual Reality tools in schools to promote benefits of chicken and egg. The presentation concluded with a hope that Niti Ayog in its recent report is exploring for inclusion of Egg, Fish and Meat in PDS.

Technical Update

Srinivasa



EFFECTS OF GROWING PERIOD LIGHTING PROGRAMS ON LAYING PERFORMANCE

Lighting programs are one of the key management tools in determining layer hen growth and laying performance. Light duration influences body weight profiles from hatch throughout the grow and until the hen reaches mature body weight in the lay period. Lighting programs also have a strong impact on the onset of sexual maturity, egg weight, and production performance.

In this study, we evaluated the impact of two common light applications on W-80 commercial bird growth and lay performances. The first treatment was the Hy-Line standard step-down (SD) lighting program starting with 20 hours of light during the first week; afterward, the light was decreased each week to reach 12 hours light at 7 weeks. The pullets were held at 12 hours light until 17 weeks of age. The second treatment (24/12) started with 24 hours of continuous light until 7 weeks of age. At 7 weeks the light was reduced to 12 hours and held until 17 weeks. The second application mimics common practice among Indian commercial layer farms. Parameters such as rearing period weekly body weight, age at sexual maturity, and production performance (hen-day %, hen-housed eggs, egg weight) were recorded and compared.

Results from the study indicate that the 24/12 lighting program reduces body weight, delays sexual maturity, limits production performances, and in general, limits genetic potential compared to the standard SD program.

TRIAL DESIGN

Hy-Line W-80 commercial strain was subjected to two different lighting practices: SD and 24/12.

- 600 chicks for each group were subject to experiment. Management practices followed the W-80 Commercial Guide for both groups.
- Birds were individually wing-banded at hatch for detailed data collection.
- Pullets were reared in floor-pens.
- No beak trimming was applied.
- During the growing period, bi-weekly body weight and mortality data was recorded.
- During the production period, body weights, mortality, production, and egg weight information was recorded.

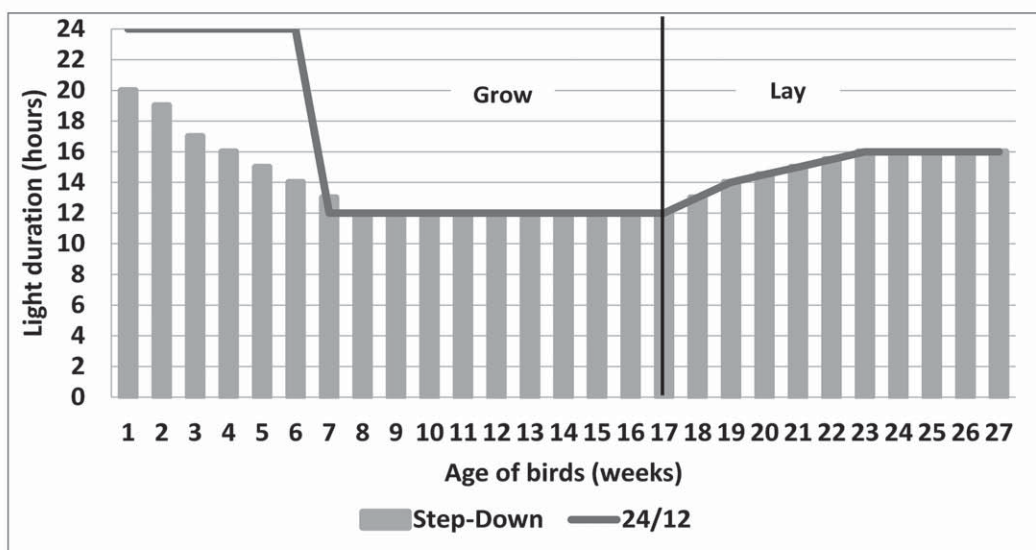


Figure 1. Lighting practices used in the study.

RESULTS

Growing Period Body Weights

- **24/12 lighting program:** Birds from this group showed a good start for body weights up to 4 weeks of age and after showed reduced weekly body weight gain.
- **Step-down lighting program:** The body weight gain in this group was steady and on target compared to W-80 standard throughout the rearing period. Body weights were 49 grams above the 24/12 lighting program birds at 18 weeks.

All results were tested at P<0.05 significance level.

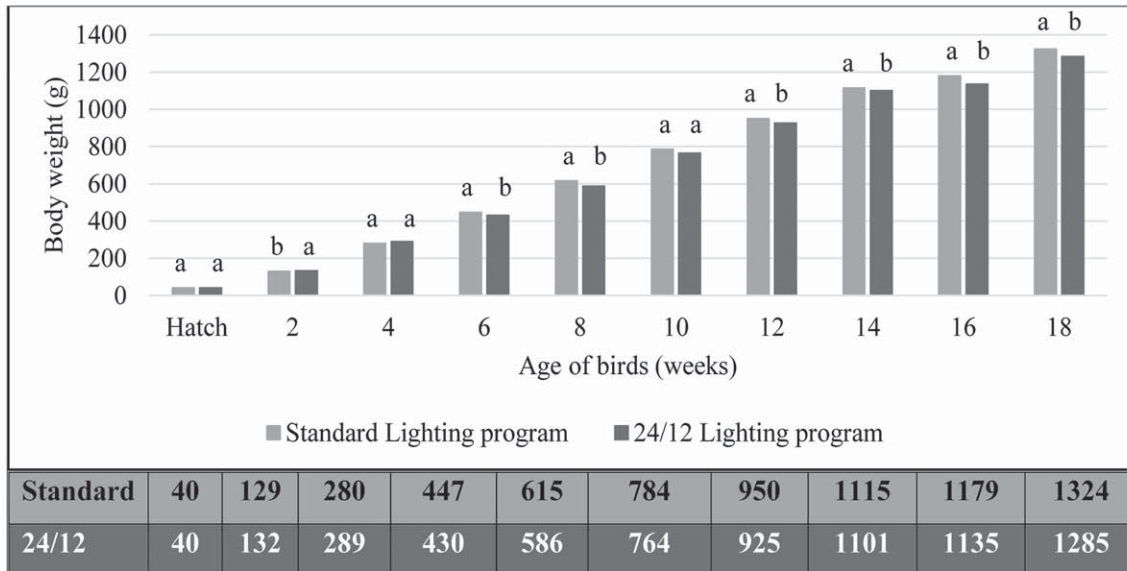


Figure 2. Comparison of body weight gain.

Sexual Maturity

Lighting programs had a significant impact on bird maturity. Birds under the step-down lighting program attained maturity 6 days earlier than 24/12 lighting program.

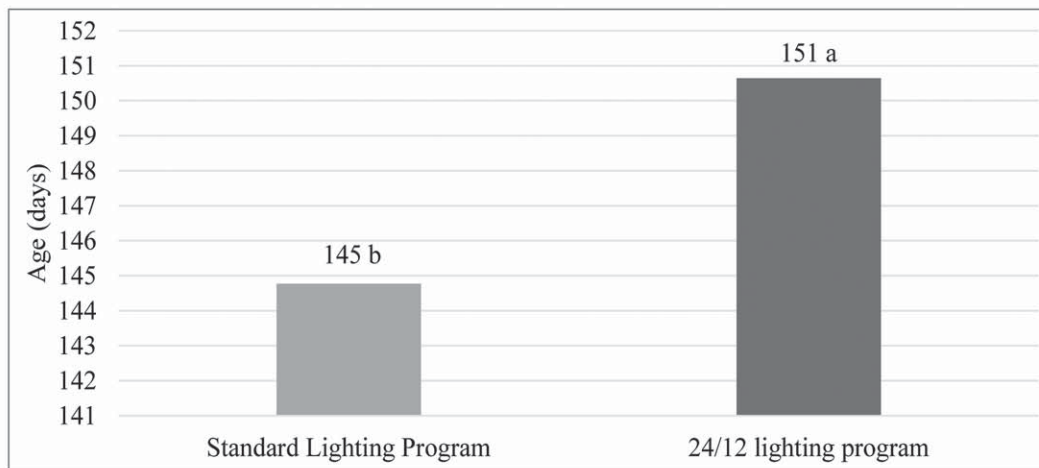


Figure 3. Comparison of sexual maturity.

PRODUCTION PERIOD RESULTS

Hen-Housed Eggs	18–30 weeks	40 weeks	60 weeks
24/12 lighting program	84 ^b	138 ^b	269 ^b
Step-down lighting program	95 ^a	149 ^a	281 ^a

Onset of lay was six days earlier for birds under the step-down lighting program. By 30 weeks of age, the step-down group had 11 more eggs compared to 24/12 program. At the end of 60 weeks, birds under the step-down lighting program laid 12 eggs more than birds under 24/12 lighting program group.

Egg Weight

Birds with the 24/12 lighting program had 1.3 to 0.5 g heavier egg weight profile starting from the first egg. In both groups, egg weights were higher than the W-80 breed standard.

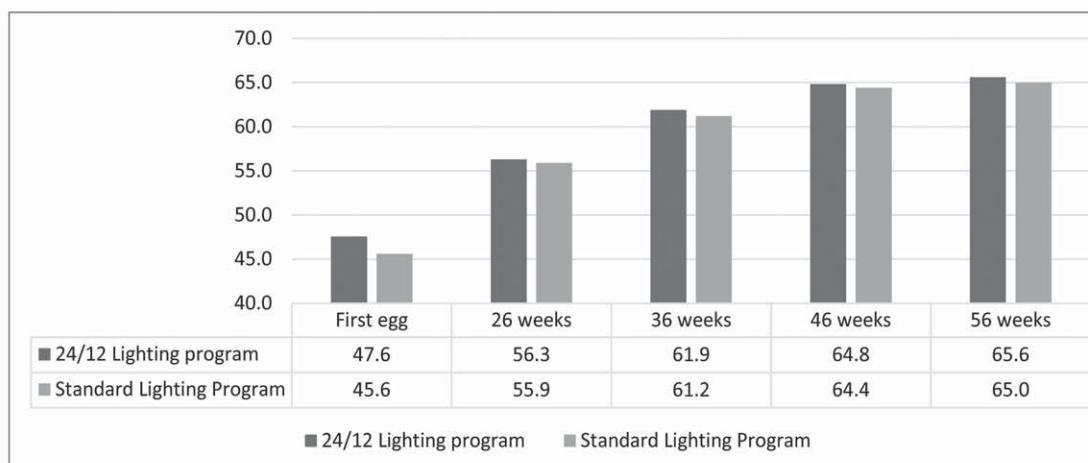


Figure 4. Comparison of egg weight.

SUMMARY

- This study shows that lighting programs in the growing period have a significant impact on body weight profiles during the rearing period, age of sexual maturity, number of eggs produced per bird, and egg weight throughout the hen's life.
- From the above study, step-down lighting program had good body weight development during rearing period. In the production period, the hens came into production 6 days earlier and by 60 weeks had 12 more saleable eggs than the birds of 24/12 hours lighting group. The heavier eggs with the 24/12 program are likely due to delayed maturity.
- The egg weight profile of the standard lighting program matches the Indian market.

CONCLUSION

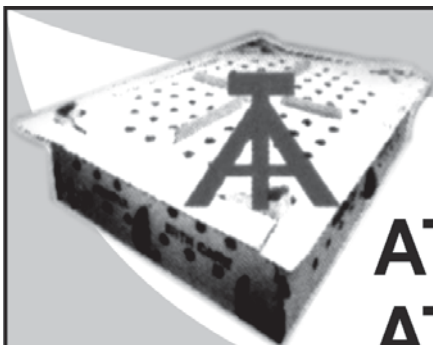
Good production performances can be achieved by using the Hy-Line standard step-down lighting program during the rearing period. This program provides good resting time to the baby chicks to establish their circadian rhythm. Therefore, the supported hormone system gives a boost to muscle, bone, and intestinal development. Additionally, there is an energy-saving component by not using 24 hours of artificial light for 7 to 8 weeks. In this study, we kept birds at 12 hours of light to mimic day length; however, in an open-sided environment, we recommend no artificial light after 7 weeks, only daylight.

Recommended lighting program for Hy-Line W-80 birds in open-sided houses in India:

Growing Period		Stimulation and Laying Period	
Age in weeks	Light hours	Age in weeks	Light hours
1	20	17	BW=1100g with 85% Uniformity
2	19	18	+1 hr
3	17	19	+ 1hr
4	16	20	+1/2 hr
5	15	21	+1/2 hr
6	14	22	+1/2 hr
7	13	23	15-16
8 to stimulation	daylight	24	15-16

Day lengths vary seasonally (more than 12 hours in summer and less than 12 hours in winter). This seasonal variation may affect the onset of production. When the day length is more than 12 hours during the rearing period, it is recommended to keep the longest day length for the entire rearing period. Light stimulate the flocks once they have 1100 grams minimum body weight with 85% uniformity and only after moving the birds to production houses. In the case of uniformities less than 85%, light stimulate the flock after attaining 1200-1250g body weight.

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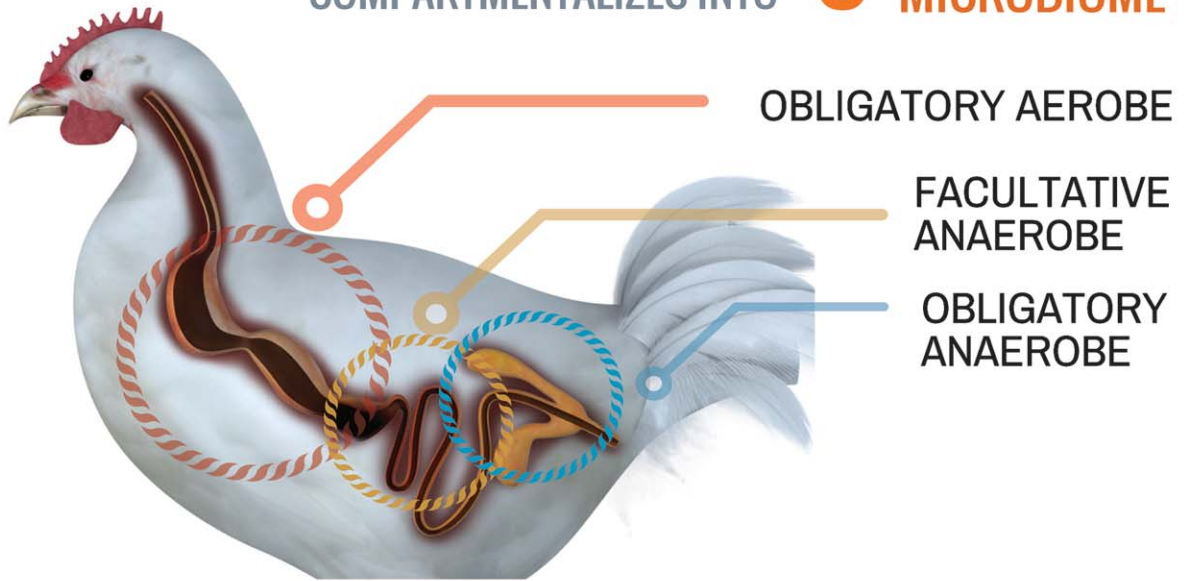
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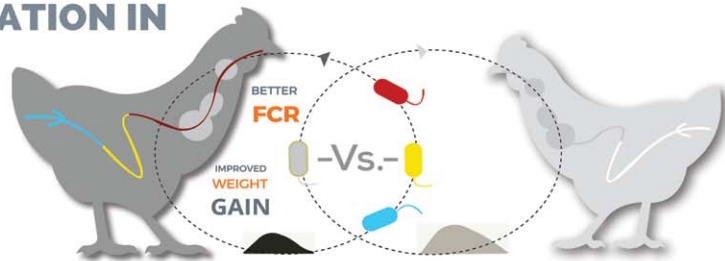


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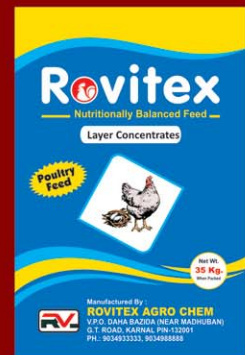
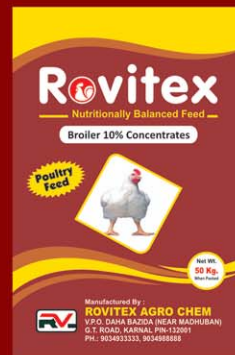
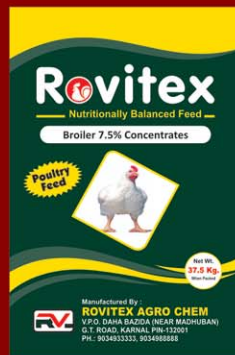
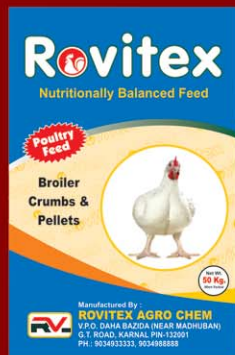
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ब्रायलर ब्रीडर्स एसोसिएशन-नार्थ द्वारा वार्षिक मीटिंग का आयोजन

ब्रायलर ब्रीडर्स एसोसिएशन-नार्थ के द्वारा इस वर्ष अपनी वार्षिक मीटिंग का आयोजन दिनांक 4-7 नवम्बर 2019, को होटल राहत पैलेस, अलमाटी, कजाकिस्तान में किया गया। इस मीटिंग में 65 ब्रीडर्स ने भाग लिया। मीटिंग की शुरुआत एसोसिएशन की कार्यकारिणी सदस्यों को पुष्प भेंट करके हुई।



ब्रायलर ब्रीडर्स एसोसिएशन-नार्थ के प्रेजीडेंट श्री गुरमिंदर बिसला ने आए हुए सभी ब्रीडर्स और फार्मा कम्पनी के मैनेजर का तहेदिल से स्वागत किया। उन्होंने आए हुए सभी ब्रीडर्स का धन्यवाद करते हुए कहा कि आप सभी ने इस एसोसिएशन को सुचारू रूप से चलाने में बहुत सहयोग किया है। समय-समय पर पोल्ट्री उद्योग में आने वाली समस्याओं से निपटने के लिए तन-मन-धन से हम सब एसोसिएशन के साथ एकजुट होकर खड़े रहेंगे और जो भी सहयोग हम पोल्ट्री की भलाई के लिए कर सकते हैं जरूर करेंगे। श्री बिसला जी ने पोल्ट्री व्यवसाय में लगातार चल रहे नुकसान के लिए चिंता जाहिर की। उन्होंने सभी ब्रीडर्स से निवेदन किया कि आप सभी अपनी

हैचरी की तरफ से सरकार को पत्र लिखें जिसमें कि सरकार ने जो अमेरिकन चिकन पर इम्पोर्ट ड्यूटी 100 प्रतिशत से घटाकर 30 प्रतिशत कर दी है उसको न घटाया जाए अन्यथा हमारा पोल्ट्री व्यवसाय संकट में आ जायेगा। साथ ही सरकार से ये भी आग्रह करें कि जिस तरह लगातार रॉ मैटिरियल जैसे मक्का-सोया की कीमतों में बढ़ोतरी हो रही है पर चिकन और अण्डे की कीमतें घटती जा रही है। हमारी उत्पादन लागत बढ़ती जा रही है और बिक्री मूल्य घटता जा रहा है जिससे हमें लगातार नुकसान का सामना कर पड़ रहा है। अमेरिकन चिकन के आने से हमारी इंडस्ट्री और भारी नुकसान में चली जायेगी। हमें इसके लिए एकजुट होकर उचित प्रयास करने होंगे।



श्री बिसला जी की बात को आगे बढ़ाते हुए श्री रवि सभरवाल, चेयरमैन, ब्रायलर ब्रीडर्स एसोसिएशन-नार्थ ने सभी फार्मर्स से निवेदन किया कि प्रत्येक पोल्ट्री उत्पादक चाहे व छोटा हो या बड़ा इस समस्या का एकजुट होकर समाधान निकालेंगे।



उनके बाद श्री सतीश गर्ग, कैशियर, ब्रायलर ब्रीडर्स एसोसिएशन-नार्थ ने एसोसिएशन के बही खातों के बारे में जानकारी दी और बताया कि एसोसिएशन को सुदृढ़ रूप से चलाने के लिए वित्तीय सहायता की जरूरत होती है जिसमें सभी ब्रीडर्स ने बढ़-चढ़ कर सहयोग किया है और उम्मीद करते हैं कि आगे भी इस तरह एसोसिएशन के साथ एकजुट रहेंगे।

इसके बाद श्री बिसला ने सभी सपॉर्सर कम्पनी के मैनेजर्स को सेमिनार के

लिए आमंत्रित किया। इसमें हिपरा कंपनी से श्री विकास मलिक, बायोमिन से श्री अरविंद चक्षु शर्मा, डेलाकॉन कम्पनी से डॉ. जितेंद्र वर्मा, सेफी वेटमेड से श्री राहुल बराड़, वेटफेज फार्मास्यूटिकल से डॉ नितेश सोनावने एवम् डीवी सोलर से श्री धनंजय अरोड़ा ने अपनी-अपनी कम्पनी के बारे में बताया और कम्पनी उत्पादों तकनीकी विषयों के बारे में भी जानकारी दी। इसके बाद एसोसिएशन के कार्यकारिणी सदस्यों द्वारा मैम्बर्स की नई डायरेक्टरी लांच की गई। अंत में श्री बिसला ने सभी फार्मा कम्पनी का सहयोग करने पर तहेदिल से धन्यवाद किया। श्री बिसला ने आए हुए सभी ब्रीडर्स का भी धन्यवाद किया।











10 Tips for reducing litter moisture

Dry litter helps keep broilers healthy, control poultry house ammonia levels and minimises the risk of carcass condemnations because of breast blisters and hock burns.

Keeping litter dry is all about prevention. The fact is that if you wait until your litter begins to cake to start increasing your timer fan settings, it is too late. It takes days or weeks of under-ventilating for the moisture to build up to the point where cake begins to form, so bumping up a timer by 15 or 30 seconds is not going to make up for days or weeks of neglect. Once litter becomes damp, it typically takes a dramatic increase in timer fan settings, i.e. double or triple, to have a significant effect on litter moisture. The problem, of course, is that dramatic increases in timer settings tend to lead to dramatic increases in fuel usage: a costly penalty with today's rising energy costs. Neither is it an environment-friendly option.

Here are 10 steps that can be taken to keep excessive litter moisture from becoming an expensive problem during cold weather.

1. Remove litter caking as soon as the house is empty

Controlling litter moisture starts the day after the previous flock goes out. Make sure to remove caking from the house as soon as possible. Not only does this get rid of some of the moisture in the litter, it tends to aerate the litter a little and that aids the drying process.

2. Keep the house warm

Try to keep the house as warm as possible between flocks. Ideally from the point of view of moisture removal, the house should be above 32°C between flocks but this may not be practical. A practical tip, however, is to close a house up tight at night and run one or two timer fans for a short period. During the day, if it is relatively warm outside, turn on some fans or drop the house side curtains to help remove

moisture from the litter. This will use some electricity but it will be cheaper than using heat to dry the litter once the next chicks are in the house.

3. Keep fans running

Run circulation fans between flocks. A little air movement across the litter goes a long way to help remove moisture from the litter.

4. Eliminate house leaks

Work on getting your houses tighter. You have probably noticed that litter caking often occurs in those cooler areas where air leakage is a problem, e.g. side walls, end walls and tunnel curtains. This is because cool air does a poor job of removing moisture from the litter. Ventilation not only brings in fresh air; it is also heats the fresh air before it moves down to bird level. This way, it removes moisture from the litter.

5. Run the fans when pre-heating

Ventilate a little when you are pre-heating a house before delivery of the new flock. This draws out a significant amount of moisture from the litter. By operating a timer fan or two, you can exhaust moisture from the house, which also allows more moisture to be pulled from the litter. This is especially true in houses with fresh litter.

Common Poultry Diseases and prevention methods

Manage the drinker system properly. If drinker height is too low or water pressure is too high, excess moisture will be added to the litter, which will have to be removed through ventilation. Make sure that drinker lines are clean by flushing on a regular basis. Debris in the water lines can result in leaky drinkers.

7. Use circulation fans throughout the flock

Circulation fans help to remove moisture from the litter in two ways. Firstly, they move hot, dry air from

the ceiling down to floor level where it is needed. Second, they gently move air across the litter surface, significantly increasing the rate at which moisture is removed from the litter.

8. Check relative humidity

Use house relative humidity to determine if you are ventilating sufficiently. The ideal relative humidity (RH) is 50-60%. If the RH is above 70% first thing in the morning, your minimum ventilation setting is probably too low and should be increased.

9. Take advantage of day/night difference

Increase timer settings during the day to take advantage of the fact that day-time temperatures are typically warmer than night-time temperatures and the relative humidity will also be lower. It may help to think of the litter as a bank. The more moisture you withdraw during the day, the less you have to withdraw at night when outside temperatures are low.

10. Be bold with timer settings

Do not increase timer settings only 10 or 20 seconds. Get ahead of the game. If you are going to make an increase to your timer fan settings, make it at least a 30-second change.

Top ten tips for good litter

1. Remove litter caking as soon as the house is empty
2. Keep the house warm
3. Keep fans running
4. Eliminate house leaks
5. Run the fans when pre-heating
6. Adjust and clean the drinker system
7. Use circulation fans throughout the flock
8. Check relative humidity
9. Take advantage of day/night difference
10. Be bold with timer settings

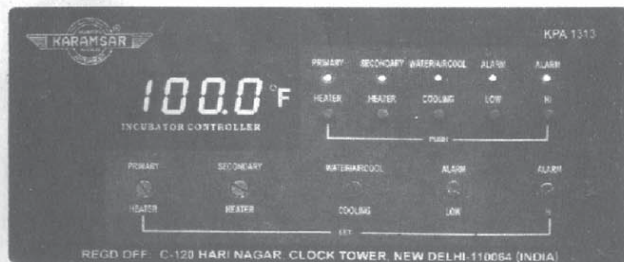
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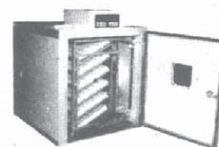
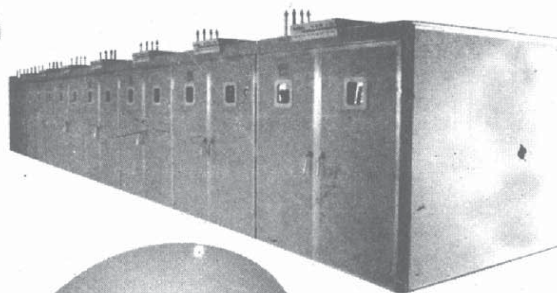
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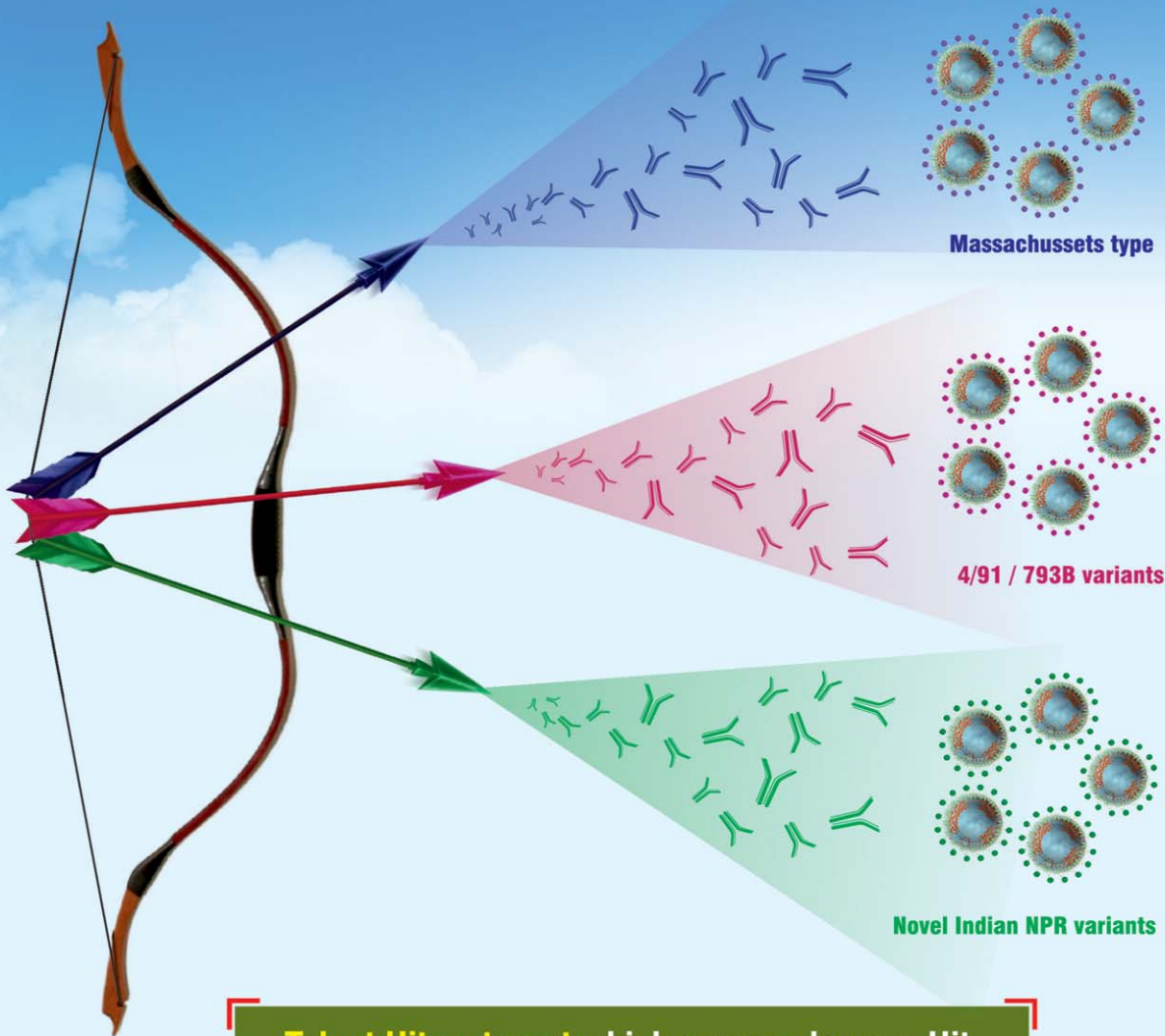
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