English monthly from Hyderabad, India

RNI Regn. No. 72452/99

Poultry Fortune

Estd. 1991

• Production • Nutrition • Management • Marketing

November 2021

Annual Subscription: Rs 800 Foreign $ 100

Inside...

Editorial

Poultry Fortune

English Monthly Magazine
(Established in May 1991)
Volume 23 Number 04 November 2021

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Editorial & Business Office:
POULTRY FORTUNE
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Website: www.poultryfortune.com

Annual Subscription
India : Rs. 800
Foreign Countries : US $ 100
or its equivalent.

Poultry Fortune will be sent to the subscribers in India by Book Post, and to foreign subscribers by AirMail.

Edited, printed, published and owned by M. A. Nazeer and published from BG-4, Venkataramana Apts., 11-4-634, A.C.Guards, Hyderabad - 500 004, India. Printed at Srinivasa Printers.
Registered with Registrar of Newspapers for India with Regn. No. 72452 / 99. Postal Regn.No. RNP/HD/1067/2021-2023.

NRS PUBLICATIONS
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Subscriptions for Poultry Fortune, English monthly, should be sent to:
The Circulation Department, Poultry Fortune, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Hyderabad - 500 004, India. Email: info@poultryfortune.com

World Egg Day Celebrated in India

After 50 years in the poultry business, the friend of Indian poultry industry Mr Paul Gittins retired at the end of September 2021

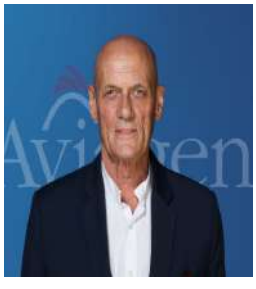
Spirulina, an edible blue - green microalgae and a good source of protein, essential amino acids, vitamins and minerals for poultry diets with no detrimental effects on health or growth performance; hence, spirulina cultivation is becoming more popular around the world

Dear Readers,

The November 2021 issue of **Poultry Fortune** is in your hands.

In the News section, you may find news about –

Srinivasa Farms marked the celebration of the 25th Anniversary of World Egg Day with various activities in the public domain and multiple campaigns running across the social media platforms to create awareness about the goodness of eggs. The celebrities, health and fitness experts egg endorsement videos have garnered an incredible amount of engagement with likes and shares by the audience on social media platforms. A 30-km Cycle rally in Hyderabad city has created widespread awareness about the egg being a super - food for all ages. The rally received an overwhelming response with participation by enthusiastic cyclists peddling for the humble egg. The IEC Chairman, Suresh Chitturi led an insightful live webinar connecting with health experts Dr Lakshmi Lavanya and Dr Anvesh Reddy, who shared the knowledge and experience with participants across a variety of key and relevant contemporary topics on increasing the awareness and importance of the eggs for all ages from toddler to older adults, and how egg being a great saviour by helping boost immunity during the pandemic for the Corona patients.



After 50 years in the poultry business and 25 years with Aviagen, Mr Paul Gittins retired at the end of September 2021. Joining Aviagen in 1996, in 2007 Paul moved to India, where he started and worked relentlessly to build up Aviagen India, promoting the growth of the ROSS brand and success of chicken growers throughout the country. He fulfilled the role of General Manager until 2019, when he became Senior Advisor to Marc Scott, Business Manager for Aviagen India.

Suguna Feeds launched their cattle feed variants - MilkyBest+ and NutriBest at their feed mill in Ganapathipalayam, Udumalpet, Tamil Nadu with an aim to address the challenges faced by farmers like unavailability of consistent quality pellet feed, adulterated raw materials and so on.

GI-OVO, The Netherlands, introduced the Egg Crate 180, a crate perfectly designed for the transport of 180 chicken eggs. In addition to the user - friendly design, the crate is not only very light, but also very strong and durable. This egg crate is an ideal solution for large consumers of eggs such as retailers, bakeries or wholesalers.

Commodity and food major Cargill has developed a technology platform to connect with farmers and help them with crop advisory, besides providing input and market linkages. Digital Saathi, the mobile based, hyper localised service platform is being piloted by Cargill in the key maize-growing regions of Karnataka in India from February this year.

Avitech Nutrition Pvt Ltd recently launched TriSorb, a premium toxin binder for the animal nutrition feed industry. TriSorb is designed to combat mycotoxins using the distinctive ABC principles of Adsorption, Biotransformation

NRS GROUP

Poultry Fortune

Our Mission

Poultry Fortune will strive to be the reliable source of information to poultry industry in India.

PF will give its opinion and suggest the industry what is needed in the interest of the stakeholders of the industry.

PF will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

PF will recognize the efforts and contribution of individuals, institutions and organizations for the development of poultry industry in the country through annual Awards presentation.

PF will strive to maintain quality and standards at all times.

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and Colonisation. Avitech Nutrition's new multi - pronged mycotoxin strategy effectively deactivates, neutralizes and eliminates the common mycotoxins present. Avitech Nutrition recently appointed Dr Sateesh Kumar Chauhan as Vice President - Research & Development based in Gurgaon. He will lead the R&D initiative of the company with a strategic focus on the phytogenic sector.

EW Nutrition India Pvt Ltd announced the launch of a best - in - class next generation gut health modifier Ventar D, an innovative proprietary blend of phytomolecules with a novel delivery mechanism. Ventar D has been the result of an integrated joint effort of EW Nutrition's research, development, production, sales and services teams. The product has been formulated to support gut health and improve performance, resulting in an increase in profitability for the customer.

The Centre cut the Customs duty on crude edible oils to zero and the Agriculture Infrastructure and Development Cess (AIDC) on all oils – crude and refined to contain surging cooking oil prices and control the rates, inflation during the festive season. The Department of Revenue under the Ministry of Finance issued two notifications that will bring the duty cut – ranging from 16.5 to 19.25 per cent – into force from Thursday. The revised duty will remain in effect till March 31. This is the third time the Centre has reduced Customs duty on edible oils over the past three-and-a-half months and first time the AIDC has been revised.

Natural Remedies Pvt Ltd hosted a webinar moderated by Dr Chandan Chatterjee, Group Product Manager at Natural Remedies where Dr S. V. Rama Rao, poultry scientist, gave his speech on the topic "Dietary modulation for better feed efficiency". Dr Rama Rao focused on the importance of diet of poultry birds to improve their feed efficiency.

India is getting enquiries for its corn (maize) from Vietnam even as it continues to export good volumes to Bangladesh and Nepal, which are sourcing more of the coarse cereal from New Delhi compared to other sources, according to traders and exporters. M. Madan Prakash, President, Agri Commodities Exporters Association said that they begun getting good enquiries from Vietnam as prices have begun to moderate.

In the Articles section -- ***Article titled Spirulina in Poultry Diet - A New Approach,*** written by Srishtipriya Prasad and other authors highlighted that the increasing demand for human protein food sources has resulted in a need for new feed materials which provide a safe source of nutrients for poultry and livestock. Alternatives to antibiotics, growth hormones and other chemicals are becoming increasingly popular in poultry nutrition currently. The cost of traditional ingredients like maize has risen dramatically in recent years. Spirulina is an edible blue - green microalgae. It is a good source of protein, essential amino acids, vitamins and minerals for poultry diets with no detrimental effects on health or growth performance; hence, spirulina cultivation is becoming more popular around the world. Spirulina is nutrient rich. It contains all essential amino acids, vitamins and minerals. It is also a rich source of carotenoids and fatty acids, especially ⊠-linolenic acid (GLA) that infers health benefits. It is also a good source of pigments, such as chlorophyll, a phycocyanin, carotenes and xantophylls. However, Spirulina's high protein content distinguishes it as a new animal feed.

Another article titled ***Potential of Essential Oil Blend in Poultry Production,*** written by Dr Koushik De highlighted that Essential Oils (EOs) are important aromatic components of herbs and spices and are used as natural alternatives for replacing antibiotic growth promoters (AGPs) in poultry feed as these have antimicrobial, antifungal, antiparasitic and antiviral properties. Beside, other beneficial effects of EOs include appetite stimulation, improvement of enzyme secretion related to food digestion and immune response activation. However, it appears that the degree of response may be influenced by the level and type of EO used and the health status of the animal. In vitro and in vivo studies showed that specific EO blends may help to reduce incidences of subclinical necrotic enteritis and coccidiosis.

The other article titled ***The Best Defense for Layers,*** written by Dr Jordon Gruber highlighted that as the key system for converting feed into protein, a chicken's gut links directly to nearly all growth and production parameters. Research has shown that the higher the intestinal lesion score, the greater the energy and protein spent on fighting diseases. The populations of beneficial or potentially harmful bacteria present in the gut are also a key indicator of bird health. Beneficial microorganisms residing in the gastrointestinal tract work to inhibit colonization and growth of potential pathogens, support immune development and provide nutrients to the host. As the demand for cage-free eggs continues to soar and producers work to navigate an antibiotic-free production model, gut health is emerging as a leading factor in the maintenance of optimal bird performance. Promoting fast development of the microbiota in the first 21 days is an effective strategy for achieving health and performance goals.

Readers are invited to send their views and comments on the news, special feature and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of poultry sector. Keep reading the magazine Poultry Fortune regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
Poultry Fortune

Suguna Feeds launches Cattle feed

Mumbai: Suguna Feeds launched their cattle feed variants- MilkyBest+ and NutriBest at their feed mill in Ganapathipalayam, Udumalpet.

With an aim to address the challenges faced by farmers like unavailability of the consistent quality pellet feed, adulterated raw materials and so on, the pioneers in the poultry business, Suguna Feeds, launched the new variants which are available for purchase pan India on http://sugunafoodsindia.com/ or contact us at 1800 103 4343.

Suguna Foods said, "As there is a clear image of the vast potential market opportunity for compound pellet feed in the cattle feed sector that has yet to be explored, we are happy to expand in all prospects and provide a unique and high-quality selection of cattle feed at economical price to meet numerous challenges faced by farmers taking in consideration their challenges".

The total cattle population in India is 19.35 Crores with 5.13 crores of Crossbred cattle. The Milch cattle population in Tamil Nadu is 77.25 lakhs, contributing 29.6% of the total milch population. This shows the fact of the enormous untapped market potential for compound pellet feed in the cattle feed business. Given the continuous growth of the cattle feed market, the main aspects for introducing Suguna Cattle Feeds are socio-economic factors and spreading awareness among the farmers.

About Suguna Foods: Suguna is one of the top ten poultry companies in the world. It operates in 18 Indian states and offering a range of poultry products and services. Broiler and layer farming, hatcheries, feed mills, manufacturing plants, vaccines, and exports are all part of the fully integrated operations. Suguna supplies frozen chicken, value-added eggs, and live broiler chicken. Suguna has developed a chain of modern retail outlets with the aim of providing customers with fresh, safe, and hygienic packed chicken. Suguna foods' popular product lines include Suguna Daily Fresh, Suguna Home Bites, Suguna Anytime processed chicken, and four types of specialty Suguna value added eggs.

For any media queries, please contact Apoorva-9967420556; apoorva@brand-comm.com

GI-OVO Introduces Egg Crate 180

GI OVO introduces the Egg Crate 180, a crate perfectly designed for the transport of 180 chicken eggs.

In addition to the user-friendly design, the crate is not only very light, but also very strong and durable. This egg crate is an ideal solution for large consumers of eggs, such as retailers, bakeries or wholesalers.

The cardboard (one-way) boxes that have been used up to now in combination with paper egg trays can easily be exchanged for the crate.

In combination with the plastic egg tray that is already in use everywhere, a sustainable system is created. Compared to cardboard, the use of the Egg Crate 180 is many times cheaper and many customers will be grateful for its use.

For more information about the Egg Crate 180, please visit www.gi-ovo.com or send an email to sales@gi-ovo.com.

Cargill goes digital to connect with farmers, eyes maize growing areas of Karnataka

Bengaluru: Commodity and food major Cargill has developed a technology platform to connect with farmers and help them with crop advisory, besides providing input and market linkages.

Digital Saathi, the mobile based, hyper localised service platform is being piloted by Cargill in the key maize-growing regions of Karnataka from February this year.

Developed in-house by the Digital Lab at Cargill Business Services India in Bengaluru that handles finance, information technology, human resources, transportation and logistics for the global business, Digital Saathi leverages technologies such as artificial intelligence and machine learning to generate and offer crop advisory services

The commodity major plans to offer crop advisory through its agtech platform Digital Saathi, besides taking it global

Cargill has already enrolled about 6,000 farmers on its platform with the help of local NGO partner in five maize-growing districts of Davangere, Chitradurga,

Shivamogga, Haveri and Bal -lari. Cargill runs a large corn processing unit near Davangere.

"We plan to onboard about 30,000 farmers by May 2022 and some 100,000 by next year," said Raman Saxena, Founder, Digital Saathi. "Digital Saathi is a step towards building farmers' ecosystem, supporting them and increasing productivity and profitability," said Simon George, President, Cargill India.

Digital Saathi provides farmers with solutions like discussion forums and information on market price, weather forecast, pre and post harvest practices among others. From next month, the app will also feature crop input e-commerce and market linkage options, Saxena said. Small and marginal farmers can gain access to multiple stakeholders such as agri-input suppliers, buyers, traders, processors, farmer producer companies and peer farmers through the app.

Cargill has set a global goal to provide training on sustainable agri practices and improve access to markets for 10 million farmers by 2030 and Digital Saathi is a step towards that direction.

Sourcing maize

Cargill plans to source maize from farmers through the app going forward and would also take the platform to other States in India.

"We're also optimistic about this platform and plan to take it to overseas markets," George said adding, it can also be deployed in allied agri sectors such as poultry, dairy and shrimp farming.

The company is also looking at bringing in other partners such as fintech and crop insurance companies on to the platform.

Avitech appoints Dr Sateesh K. Chauhan as Vice President – R & D

Dr Sateesh Kumar Chauhan

Gurugram: Avitech Nutrition Pvt Ltd recently appointed Dr Sateesh Kumar Chauhan as Vice President-Research & Development. Dr Chauhan will be based in Gurgaon.

Dr Chauhan holds a Post graduate degree in Pharmacy Operations from Birla Institute of Technology & Science, Pilani and a Ph. D from CCS University, Meerut.

Dr Chauhan will lead the R&D initiative of Avitech Nutrition with a strategic focus on the phytogenic sector. Dr Chauhan has a rich experience of 30 years in the Research and Development of pharmaceuticals and herbal products.

Dr Chauhan's induction into Avitech's R&D will enable Avitech Nutrition greater focus on momentum in its effort to bring innovative solutions to the animal nutrition sector.

Avtech Launches TriSorb :

Gurugram: Avitech Nutrition Pvt Ltd recently launched TriSorb - a premium toxin binder for the animal nutrition feed industry.

TriSorb is designed to combat mycotoxins using the distinctive ABC principles of Adsorption, Biotransformation and Colonisation. Avitech Nutrition's new multi-pronged mycotoxin strategy effectively deactivates, neutralizes and eliminates the common mycotoxins present.

Avitech Nutrition has been in the field of toxin binders since its inception in 1996 and the latest offering TriSorb represents its commitment to provide the feed milling industry a comprehensive mycotoxin management strategy.

TsriSorb is available in 25 Kg HDPE bag

EW Nutrition Launches Ventar D, the Next Generation Gut Health Optimizer

Visbek: EW Nutrition announces the launch of a best - in - class next generation gut health modifier. Ventar D is an innovative proprietary blend of phytomolecules with a novel delivery mechanism.

Ventar D addresses key requirements of the animal nutrition industry. The product has been formulated to support gut health and improve performance, resulting in an increase in profitability for the customer. Ventar D has been the result of an integrated joint effort of EW Nutrition's research, development, production, sales and services teams.

Michael Gerrits, Managing Director EW Nutrition, emphasizes the success of the company's in - house holistic research and development processes: "EW Nutrition is committed to delivering top - notch gut health solutions to reduce the dependency of the animal nutrition industry on antibiotics. Starting from the in - depth understanding of customer needs, a 100 per cent backward integrated approach allows for seamless support by EW Nutrition throughout the customer's journey".

Ruturaj Patil, EW Nutrition's Product Manager Ventar D, speaks of the benefits that Ventar D brings to its customers: "The

efficacy of any effective gut health solution lies in its formulation, stability and delivery in the gastro - intestinal tract. Ventar D offers a proprietary formulation, best in class pelleting stability and an innovative delivery system. We are excited to bring this novel solution to our customers and be part of their journey to make animal production more sustainable, while increasing profitability".
For more information, please visit https://ew-nutrition.com/animal-nutrition/products/ventar-d/.

About EW Nutrition:
EW Nutrition offers animal nutrition solutions to the feed industry. The company's focus is on gut health supported by other product lines. EW Nutrition researches, develops, produces, sells and services most of the products it commercializes. In 50 countries, key accounts are served directly by EW Nutrition's own personnel.

Retirement of a True Aviagen and Industry Champion

After 50 years in the poultry business and 25 years with Aviagen, Paul Gittins retires at the end of September

Paul Gittins

Udumalpet, India:
"Industry pioneer, great colleague, patient mentor, humble gentleman and customer champion" have all been used to describe Paul Gittins, Senior Adviser to Aviagen India, who retired at the end of September.
Joining Aviagen in 1996, in 2007 Paul moved to India, where he started and worked relentlessly to build up Aviagen India, promoting the growth of the Ross brand and success of chicken growers throughout the country. He fulfilled the role of General Manager until 2019, when he became Senior Advisor to Marc Scott, Business Manager for Aviagen India.
History of dedication and expanding a global reach
Paul graduated from the West of Scotland Agricultural College, followed by 20 years in chicken and turkey processing, planning and marketing for Golden Produce and Buxted Poultry in the United Kingdom and producing poultry for major British retail chains.
In 1988, he traversed the Atlantic to Canada with Maple Leaf Foods, starting the first air - chilled processing plant in North America and launching Maple Leaf Prime, which remains a leading Canadian brand.
Eight years later in 1996, he moved back to Europe to join Aviagen Scotland as Marketing Manager and then expanded into sales and key accounts. However, blazing new pathways is in Paul's blood. In 1999 he began an intense decade of helping to build new operations for Aviagen, starting in Turkey with Ross Anadolu (now Aviagen Anadolu) and then in 2003 furthering the company's reach in Asia, setting up the Bangkok office and Ross Siam JV and also playing a role in establishing Aviagen Australia and New Zealand.
"I always wanted to join the merchant navy and see the world. Instead I sold chickens and saw the world and much more of it", quipped Paul. "It has been a great adventure and I am grateful to Aviagen, our customers and my colleagues throughout the industry for the opportunity to work alongside them, break new ground, help our customers grow their businesses and have a lot of fun in the process".
"Despite his abundant accomplishments and contributions, Paul remains humble, always the gentleman and always willing to help others," commented Marc. "Having the great pleasure of working alongside him through many Aviagen milestones, it is evident that, for Paul, it has always been about people -- whether they are colleagues, customers, suppliers or acquaintances – and many around the world will retain fond memories long after his career ends. I thank Paul for the hard work, dedication and fun he has brought to us all and wish him every happiness in his retirement".

THE ORIGINAL ALPHA D3

1980s
Research at University of Georgia

1989
Patent granted for the Alpha D3 metabolite

2010
Alura launches Alpha D3 in poultry

2010
Alura bring Alpha D3 to India

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- Proven ROI in Broilers & Layers
- Thermostable for palletisation
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DIETARY MODULATIONS FOR BETTER FEED EFFICIENCY

By Dr Raina Raj, Head of Marketing, Natural Remedies Pvt Ltd

Natural Remedies By Pvt Ltd is an Indian herbal veterinary health care company growing globally in 30 countries under leadership of Mr R. K. Agarwal, Chairman and Mr Anurag Agarwal, MD & CEO. It brings solutions in terms of the health products for all species like ruminant, poultry, aqua and pets. We have world class R&D laboratory located in Bangalore where more than 40 scientists are working hard and have contributed in isolation of over 220 phyto compounds and published more than 100 monographs, 120 scientific articles in peer reviewed journals and over 15 patents. We have GLP certified in vitro laboratory for safety studies and we maintain the consistency of our product batch after batch. The company organizes the webinar series Natural is future 2.0, where national and international renowned speakers deliver their speech related to animal and poultry health.

In the month of September, we hosted a webinar moderated by Dr Chandan Chatterjee, Group Product Manager at Natural Remedies Pvt Ltd where eminent poultry scientist, Dr S. V. Rama Rao conveyed his valuable speech on the topic "Dietary modulation for better feed efficiency".

Dr S. V. Rama Rao focused on the importance of diet of poultry birds to improve their feed efficiency. He begins his talk with briefing the chicken intestine and its functions. He discussed that the gut of the poultry birds has the vitalrole in conversion of feed to egg as well as body mass. The layer birds can convert 110 gm of feed into 48 gm of egg mass. Whereas, the broilers consume 3.5 to 4 kg feed in 40 to 42 days to gain body weight of around 2.5 to 2.7 kg. Anatomically the digestive system of poultry bird consists of esophagus, proventriculus, gizzard, duodenum, jejunum, cecum, colon, rectum and vent. The gut has dual role in digestion as well as in preventing entry of pathogens by acting as a protective barrier.

The complex food materials are digested, dissimilated and absorbed into simple substances like glucose, amino acids and fatty acids. The immune - components of the gut system of chicken consist of bursa of fabricius, caecal tonsils, meckel's diverticulum, payer's patches and epithelial lymphocytes which have major role in protection barrier. Hence, it can be inferred that the birds with healthy intestine exert good immune system and superior health condition.

He pointed out that the lower feed efficiency is due to the imbalanced diet, contaminated feed with mycotoxins and pesticides, pathogens and also the poor water quality and environmental stress. The typical poultry diet consists of maize & cereals of 50 to 65%, SBM & oil seed cakes of 25 to 40% and additives of 5 to 12%. The non - starch polysaccharide (NSP) is considered as anti-nutritional factor for poultry birds causing detrimental effect on nutrient digestion and absorption, increasing energy requirement for maintenance of gut and developing necrotic enteritis.

tAfter narrating the gut anatomy and physiology of poultry birds, he initiated his elaborative discussion on the focused area like easy food, gut potentiates, inert fiber, enzymes and various stressors.

Easy food:

Easily digestible food is also called baby food. It is known that hydrolysable protein is having higher digestibility than conventional protein. Hence, feed supplemented with 5 or 10% of hydrolysable protein from soyabean meal improves the feed efficiency among the birds.

Emulsifier:

Most of the studies show that addition of emulsifier to the poultry feed has a positive impact.In one of the studies, emulsifier showed progressive increase in feed efficiency as compared to control. It was found that addition of emulsifier at the level of 300 gm per ton of feed develop 1.668 food conversion ratio (FCR) whereas, the birds of control group show FCR of 1.697.

Effect of bile salt on FCR of birds:

Bile salt has an important role in increasing the feed efficiency in poultry birds. One study showed that each ton poultry feed supplemented with 10 kg of bile salt improved the feed efficiency significantly. The study data revealed the FCR of 1.56in test group incomparison ofthe control group showing FCR of 1.5888.

Marygold phenols and leutein can be used as an alternative to antibiotic growth promoter (AGP). They reveal significant improvement of feed efficiency as compared to the positive and negative control groups where feed supplemented with or without AGP.

Gut potentiates:

Probiotics: Probiotics are live organisms which are beneficial for the gut of the birds and helps in maintaining healthy gut system with higher feed digestibility. In one of the study it was found that the addition of probiotics at the rate of 600, 1200 and 1600 million CFU per kg of feed revealed the FCR of 1.693, 1.705 and 1.654 respectively.

Now a days bacteriophage treatment in feed is gaining popularity in poultry industry as it has beneficial effect in digestibility. The dose rate at 1 x 10 6 PFU / bird in drinking water showed better feed efficiency among the birds.

Na-butyrate as alternative to antibiotic growth promoter

Na butyrate has a potential impact in improving feed efficiency among birds. Na butyrate is dissociated into butyric acid at the lower intestine which promotes

acid environment and prevents the growth of the harmful bacteria.
Some studies showed that the use of betaine could increase the feed efficiency in birds.
Inertfiber:
There are some oligosaccharides helpful for the growth of beneficial microorganisms in the gut. It was observed that addition of 250 gm / ton of GOS in broiler feed led to lower FCR of 1.56 as compared to the birds of control group. However, the optimum dose of the inert fiber is the most important to gain maximum feed efficiency in broilers.
Pure fiber supplementation:
The supplementation of pure fiber in poultry diet is essential when the dietary fiber level is below 3% to improve the feed efficiency in birds.
Natural fiber:
Supplementation of natural fiber like rice husk, soya husk or groundnut husk shows consistent improvement of feed efficiency in broiler birds.
Enzymes:
Dr Rama Rao narrated that there are 3 types of enzymes viz. phytase, NSP enzymes and protease having potential impact in poultry diet. Phytase super dosing has a significant effect on body weight leading to > 6.5 unit of feed efficiency. Although, it should be performed in a neutral pH environment of 6.5 to 7.0 for obtaining optimum result. Moreover, combination of phytase with inositol improves the feed efficiency among birds. Cocktail enzymes as well as enzymes in combination of probiotics significantly improve the feed efficiency and body weight in broiler birds. We can remarkably reduce the FCR after using the cocktail enzymes. In case of layer birds cocktail enzymes help to save around 4.5g feed per egg. Supplementation of xylanase enzyme is also important in improving the feed efficiency, however, higher levels of xylanase i.e. more than 600 unit / kg is also detrimental. Supplementation of alpha galactosidase in feed improves FCR by 6 units.
Papain:
Supplementation of papain at a rate of 1000 gm per ton of feed had shown improvement in body weight gain of the broiler birds as well as feed efficiency as compare to the control group.
Summer stress management
Dr Rama Rao elaborated that in summer season the feed intake as well as feed efficiency fall drastically. Addition of guanidinoacetic acid (GAA) during summer season at the rate of 600g and 800g per ton of feed improves the FCR of the birds and shows positive impact in reducing heat stress. Betaine is another feed additive which helps to increase the feed efficiency by approximately 6 units per bird in the summer season. It regulates the osmolaritic tension of the cells and retains the minimum water level required for normal functioning of the cells.
Dr Rama Rao concluded that supplementation of poultry diet with feed additives like emulsifiers, bile salts, enzymes and probiotics helps to improve the FCR and ultimately saves the feeding cost which is beneficial to the poultry farmers. The questions addressed during the session are as follows:
Explain the synergistic effect of various supplements in increasing feed efficiency?
Dr Rama Rao: There arefeed supplements which show synergistic response at gut level and improve feed efficiencye.g.NSP enzymes and probiotics. However, not all substance will show the synergistic effect at gut level.
How to enhance caecal microbial fermentation and what will be its direct impact?
Dr Rama Rao: Strategic targeted delivery of butyric acid, essential oil and probiotics directly at the posterior part of the intestine or caecum helps to reduce the pathogenic bacteria population like Clostridium spp. and enhances feed efficiency.
Does betaine hydrochloride show similar effect like anhydrous betaine in osmoregulation and thermoregulation?
Dr Rama Rao: Betaine is naturally better adapted in the cellular level of biological system. However, higher concentration of betaine hydrochloride or sulphatemay have some negative impact. Betaine anhydrous is adapted well by the cells.
How beneficial are the phytogenic compounds in improving feed efficiency?
Dr Rama Rao: Marygold phenols and leutein show good results as compared to AGP in chickens. So the phytogenic additive can be beneficially used without any side effect as these are derived from natural sources.
High energy low protein or high protein low energy which diet is recommended?
Dr Rama Rao: We need to provide a balanced energy and protein diet to the birds. They should not be less than the recommended level in diet.
Are there any incompatibilities among the feed ingredients to be considered while formulating the feed?
Does any ingredient show antagonist effect with choline chloride present in feed?
Dr Rama Rao: The choline is very much hygroscopic material. It may interfere with some nutrients like amino acids, vitamins and trace minerals antagonistically. So, choline chloride should be added separately to protect the food ingredients which are oxidative in nature.
Can we use higher dose of Na-butyrate or enzyme to improve absorption of multiple ingredient diet used for commercial layer?
Dr Rama Rao: All macro or micro nutrients should be provided only at optimum recommended doses. However, super dosing of Na-butyrate may have beneficial effect.

Can feed additives with immune modulating property enhance feed efficiency?
Dr Rama Rao: The compounds which help to improve gut development and function, can definitely improve the feed efficiency. However, the feed efficiency can be improved upto the genetic potential of bird not beyond that.

Is there any way to improve feed efficiency at the cellular level?
Dr Rama Rao: There are many literatures available regarding this topic, but more trails and investigations are required.

Is it possible to have 1:1 FCR in case of present breed?
Dr Rama Rao: Theoretically it may be possible when there is 100% digestibility and assimilation of the feed achieved in genetically modified birds with improved feed efficiency. However, in reality there are some physiological limitations which prevent to achieve this goal.

Eggs for all - A Nutrient Goldmine

25th Anniversary of World Egg Day 2021 - Celebrations

Hyderabad: Srinivasa Farms marked the celebrations of the 25th Anniversary of World Egg Day with various activities in the public domain & multiple campaigns running across the social media platforms to create awareness about the goodness of eggs.
The celebrities, health and fitness experts egg

Fitness

endorsement videos have garnered an incredible amount of engagement with likes and shares by the audience on social media platforms. The proteins contained within eggs are highly important in the development of the muscles the fitness enthusiasts at the gyms have endorsed the importance of adding egg to their daily diet after their heavy workouts.
A 30km Cycle rally in Hyderabad city has created widespread awareness

Celebrity Endorsement

about the egg being a super-food for all ages,

IEC Chairman Chitturi Suresh during World Egg Day

the rally received an overwhelming response with great participation by enthusiastic cyclists peddling for the humble egg.
TV shows & Interviews saw Mr Suresh highlighting how eggs have been recognized as a protein powerhouse for many years as they contain the highest quality protein naturally available.
Eggs are playing a significant role in the eradication of malnutrition around the world, thanks to their affordability

World Egg Day

combined with their nutrient density, helping to dramatically improve the health outcomes of children in nutritionally vulnerable areas. The egg offers a host of unique benefits in our diets and plays a valuable role in supporting the growing global population.
The local Radio promotions made a buzz about eggs offering a healthy and sustainable source of essential nutrients needed for all stages of life.
Containing the majority of vitamins, minerals and antioxidants required by the human body, eggs are often referred to as natures wonder food.
Egg are the world's most versatile Ingredient. The World Egg day special cookery shows have highlighted how the

Fitness

eggs are a serious power ingredient in the kitchen. Many famous egg recipes have been shared making the egg the star of every meal.
The IEC Chairman, Suresh Chitturi led an insightful live webinar connecting with

Cycle Rally

health experts Dr Lakshmi Lavanya and Dr Anvesh Reddy, who shared the knowledge and experience with participants across a

Health Expert Endorsement

variety of key and relevant contemporary topics on increasing the awareness and importance of the eggs for all ages from toddler to older adults and how egg being a great saviour by helping boost immunity during the pandemic for the corona patients.
The participation was highly engaging and interactive with the audience getting to know many important facts about the egg from the expert panel.
Suresh's presentation highlighted the importance of increase in egg consumption, and how egg plays an important role in preventing malnutrition, stunting and other growth issues in children. He also emphasized how egg plays an important role in the

diet from toddlers to the older adults. Worldwide Egg production provides jobs to millions of people and helps in generating income thereby reducing poverty.

The live webinar also hosted an exciting and fun filled Egg Quiz. The participation was overwhelming from the egg enthusiasts across pan India that tested the knowledge, dispelled some of the top myths, and uncovered the real facts on the nutrition and incredible protein food, the eggs. The top quiz winners were presented with gift vouchers.

Centre Scraps Import Duty on Crude Edible Oils, lowers agricess

Move to contain surge in cooking oil prices, rein in inflation

New Delhi: The Centre on Wednesday cut the Customs duty on crude edible oils to zero and the Agriculture Infrastructure and Development Cess (AIDC) on all oils – crude and refined to contain surging cooking oil prices and control the rates, inflation during the festive season.

The Department of Revenue under the Ministry of Finance issued two notifications that will bring the duty cut – ranging from 16.5 to 19.25 per cent – into force from Thursday. The revised duty will remain in effect till March 31. This is the third time the Centre has reduced Customs duty on edible oils over the past three-and-a-half months and first time the AIDC has been revised.

According to these notifications, the import duty on crude palm oil (CPO), crude soyabean oil and crude sunflower oil has been reduced to zero from 2.5 per cent fixed last month. The import duty on RBD palmolein, RBD

palm oil, refined soyabean oil and refined sunflower oil has been reduced from 32.5 per cent to 17.5 per cent.

Duty slashed

The import duty on RBD palmolein, RBD palm oil, refined soyabean oil and refined sunflower oil has been reduced from 32.5 per cent to 17.5 per cent. In addition, the Centre has cut AIDC on CPO to 7.5 per cent from 20 per cent and on crude soyabean oil and crude sunflower oil to 5 per cent from 20 per cent.

Post revision, the effective customs duty on crude palm, soyabean and sunflower oils will be 8.25 per cent, 5.5 per cent and 5.5 per cent respectively. The effective duty on RBD palmolein, refined soyabean oil, and refined sunflower oil will be 19.25 per cent. The Centre had last reduced the import duty on the above commodities on September 11

Solvent Extractors Association of India (SEA) President Atul Chaturvedi said the duty cut will help reduce cooking oil prices by ₹6-8 a kg.

The duty cut had an immediate impact in the domestic and global market. On MCX, October crude palm oil contract dropped by 3.5 per cent, while November contract slipped by 2.8 per cent.

Chaturvedi said the Malaysian palm oil market went up by about 150-170 ringgits (₹2,700-3,075) a tonne after the duty cut announcement. Palm oil futures on Bursa Malaysia topped 5,000 ringgits ((₹90,550) a tonne after a week's gap.

The Centre's move to reduce the edible oils duty is to check the rising trend in prices. It is also aimed at controlling inflation with retail inflation based on Consumer Price Index rising. Retail inflation rate for "Oils & Fats comprising edible oils surged to 34.19 per cent in September against 33 per cent in August and 27.83 per cent in September 2020, according to a report published in The Hindu Business Line.

Enquiries Rising from Vietnam for Indian Corn; Nepal, Bangladesh buys good volumes

Chennai: India is getting good enquiries for its corn (maize) from Vietnam even as it continues to export good volumes to Bangladesh ttand Nepal, which are sourcing more of the coarse cereal from New Delhi compared to other sources, according to traders and exporters.

"We have begun getting good enquiries from Vietnam as prices have begun to moderate," said M. Madan Prakash, President, Agri Commodities Exporters Association.

Viable option

The US Department of Agriculture has pegged India's corn exports at 3.5 mt during October 2020-September 2021 marketing year. "In 2020 - 21, high global corn prices, supported by the steep fall in Brazil's production due to drought and shrinking stock levels in the US, have made Indian corn a viable option on the global market", it told.

"The kharif crop is reported to be good. Hence, prices have dropped as the new crop has begun to arrive, mainly from South India, in the market. Prices are down to Rs 19,000-20,000 a tonne for delivery in Chennai", informed Prakash.

Prices are currently Rs 18,500-18,750 free-on-rails in Chennai.

Bihar source

"We are exporting corn to Bangladesh at around Rs 21,000 a tonne through the India-Bangladesh land borders such as Petrapole", said Mukesh Singh, Director, MuBala Agro Commodities Pvt Ltd.

Most of the corn exported to Bangladesh is sourced from Bihar and to some extent, Uttar Pradesh.

"We are getting offers from Maharashtra that are priced low at around Rs 15,000-16,000 but logistics is a problem", Singh added.

In July this year, when corn prices sky-rocketed in the global market and topped wheat rates for the first time in 10 years, India quoted its produce at Rs 23,150 a tonne free-on-board.

"During July-September exporters who had stocks of the old crop with them shipped to Vietnam at $310-20 cost and freight", ACEA's Prakash said.

A trade analyst said Vietnam has been buying more corn from India over the last six months. "Vietnam will continue to buy to meet its feed requirements. Almost all countries are buying from the global market", the analyst told.

The USDA said surging freight price is another reason why Indian corn made its way into South-East Asia. "Global ocean freight rates increased rapidly due to higher Chinese demand for agricultural commodities, leading to congestion in Chinese ports, delays, and lower availability for vessels", USDA said, according to a report published in The Hindu Business Line.

A Surgical Strike on Bacteria

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For millions of years, bacteriophages have been hunting down and killing bacteria. **eXolution Bacterphage F** uses a cocktail of these ancient killers to purge disease-causing bacteria in a formulation created specifically for use in poultry.

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E. Coli
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Clostridium Perfringens
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ProPhorce SR – Global Market Leader in Tributyrins for Animal Nutrition – celebrates its 10- year anniversary

This quarter, global feed additives producer Perstorp, will celebrate 10 years of commercial application of pioneering tributyrins solution ProPhorce SR in animal nutrition. ProPhorce SR quickly became one of the company's star products to support gut health and performance. The innovative application of the esterification process ensured odorless butyric acid that is released where it is of most benefit to the animals.To mark the occasion, Perstorp is organizing a series of activities to celebrate and commemorate the product's accomplishments throughout the decade.

A Proud Pioneer

ProPhorce SR is the pioneering tributyrin solution that revolutionized the market; over the course of a decade, it has become one of the weapons of choice to support gut health and performance, with more than 20 billion broilers treated and used in more than 50 countries worldwide.

"I'm happy that we have been able to help so many customers around the world improving their performance thanks to the application of ProPhorce SR". saysGeert Wielsma, Vice President Sales EMEA & Americas and former development team member for ProPhorce SR. "We are about to finalize a new production line in our Dutch feed additives production plant that will facilitate the next decade of growth for our tributyrin solutions".

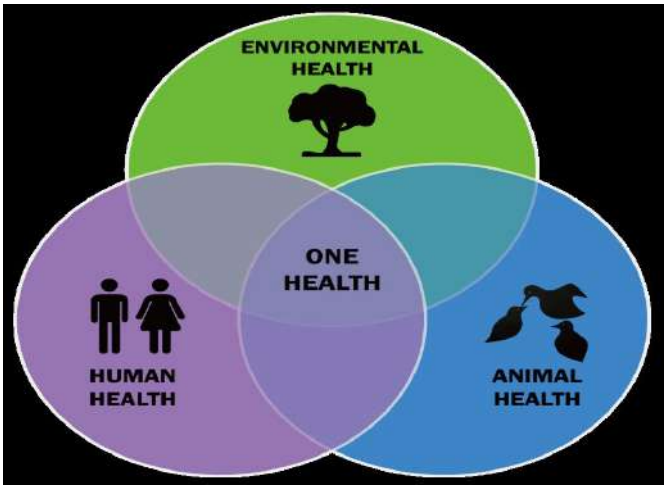
Looking back and looking forward

This year marks a double celebration for the company as Perstorp is turning 140 years. That's 140 years of thinking about the future and developing smart solutions to advance everyday life in an ever-changing world. One molecule can change everything, and it is under that premise and following focused innovation as its core value, that ProPhorce SR was born.

"When the concept of ProPhorce SR was born and we did our first animal trials, we knew we had something very special in our hands. Feed producers in over 50 countries are using ProPhorce SR nowadays with more than 50 trials ran all over the world. Results can be summarized with 2 words, efficacy and reliability. We would like to thank our customers for the loyalty and the trust they have placed in the company and in ProPhorce SR during these 10 years, they motivate us to continue providing the market with innovative solutions for the decades to come", says José Maria Ros, Global Technical Manager.

AGRICULTURAL TRANSITION IN FOOD ANIMAL PRODUCTION: "ONE HEALTH" PERSPECTIVE

Author: Dr Shirish Nigam, Managing Director (South Asia), EW Nutrition India Pvt Ltd



Sarve Bhavantu Sukhinah, Sarve Santu Nir-Aamayaah, Sarve Bhadraanni Pashyantu
Maa Kashcid-Duhkha-Bhaag-Bhavet. Meaning, may all become happy, may none fall ill.
May all see auspiciousness everywhere may none ever feel sorrow. This has been our thought since time immemorial as the driving force was our practice with a deep - rooted insight of "Vasudhaiva Kutumbakam" meaning **"The world is one Family".** But in modern world somewhere we have missed this practice, being sheer selfish with growth as sole motto! Which is not wrong, but for sustainability and betterment of the mankind and the mother earth we need to revisit our process and that's why **One health!**

According to the Centre for Disease Control and Prevention, One Health is the integrative effort of multiple disciplines working locally, nationally and globally to attain optimal health for people, animals and the environment.

The One Health concept recognizes that human health is connected to the health of both animals and the environment. Within the One Health framework, livestock operation productivity and efficiency involve a triad of interactions between the animal, equipment and environment and worker.

Diseases of animal origin that is transmissible to humans, such as avian influenza, rabies, Rift Valley fever and brucellosis, pose worldwide risks to public health that must be prevented and controlled.

In the developing country like India, we can't even neglect the pathogens of animal origin that are not transmissible to humans. In fact, they can lead to production losses and a reduction in the available food supply, leading to serious public health problems caused by food shortages and protein deficiencies as they can have a severe impact on the production of animal protein.

These risks are increasing with trade globalisation, global warming and changes in human behaviour, all of which provide multiple opportunities for pathogens to colonise new territories and evolve into new forms.

It is worth noting that,

- 60% of pathogens that cause human diseases come from domestic animals or wildlife.
- 75% of emerging human pathogens are of animal origin.
- 80% of pathogens that are of concern for bioterrorism originate in animals

So how it is going to impact the Global food security? The answer is simple yet alarming as more than 70% additional protein is to be needed to feed the world by 2050 (FAO, 2011) and more than 20% of livestock production losses are linked to animal diseases.

Animal diseases directly pose a threat to incomes of the rural communities solely depending on livestock for their livelihood. As per the Reports from FAO& OIE; 2015.,More than 75% of the billion people in the world who live on less than $2 per day depend on subsistence farming and raising livestock to survive.

The world has seen many epidemics in the past, but the recent COVID 19 turmoil made the world stood still and forced us to take a pause and rethink about what have gone wrong, where are we missing. It is just the latest example of a previously unknown disease to jump from animals to people. It is unlikely to be the last. Now it has become very crucial to Understand the connections between biodiversity, ecosystems and infectious diseases.

One Health approach has been recommended to facilitate communication and collaboration across research disciplines in responding to challenges in human, animal and environmental health. While One Health may have generated a great deal of research interest in the infectious disease disciplines, the One Health model has yet to fully overcome the research silos and barriers which can prevent cross - discipline collaboration. To date, research emphasis has been placed on the animal health or production

practices, with very little research attention placed on the worker and his / her interaction with the animal or environment.

Putting the "One Health" vision into practice has been facilitated by a formal alliance on this topic between the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE). The three Organisations have published a joint Concept Note clarifying their reciprocal responsibilities and their objectives in this field (see note). They have also decided to choose the following as priority topics for their joint actions: rabies, which still kills nearly 70,000 people every year, zoonotic influenza viruses (those causing certain types of avian influenza, for instance) **and antimicrobial resistance (AMR).**

Why it has been advocated consistently to address the issue of AMR, let us understand it in a simple way, many of the same microbes infect animals and humans, as they share the eco-systems, they live in. Drug - resistant microbes can be transmitted between animals and humans through direct contact between animals and humans or through contaminated food, so to effectively contain it, a well-coordinated approach in humans and in animals is required. Efforts by just one sector cannot prevent or eliminate the problem, thus, professionals with a range of expertise in different sectors - e.g., public health, animal health, plant health and the environment - should join forces to support One Health approaches.

Consequences of Antimicrobial resistance (AMR)

Today we are facing approximately 70,000 deaths each year due to AMR and 90% of all the deaths are occurring in low and middle - income countries. A report published by ILRI in 2021 reveals that in LMICs by 2030 an increase of 67% Anti-microbial use is anticipated along with a 10% loss in livestock production. This will cost world around 3.4 trillion USD (equivalent of 40% of expenditure on health today) this will force approximately 24 million of people into extreme poverty. Apart from this a horrible figure of 10 million deaths each year from AMR by 2050, declared by WHO and that's thoughtfully alarming!

One Health practices in livestock farming and aquaculture can curb the spread of antimicrobial resistance - a threat to the lives of millions of people and animals in low and middle-income countries.

One health approach: Paving the way for Burden and Risk reduction

Joint multisectoral investment and synergism has the potential to reduce the health risk to the community, animals and environment. Such investments bring the power for driving the one health approach by breaking the sector silos and uniting the experts in the domains and thereby delivering the coherent policies. This offers the most effective and sustainable approach when it comes to tackle the health of animals, people and the environment in the possible areas of their intersection.

Opportunities and Challenges in livestock production with one health Paradigm

There are umpteen opportunities for implementing the one health approach in animal husbandry practices, covering everything will be beyond scope of this article. Let's understand the work process with an example in poultry industry; we all know that dust, microorganism contaminant gases, higher FCR, flock mortality, AMR and occupational hazards etc are some factors and challenges associated with poultry rearing.

Most of the advancements for profitability had already been explored and are tweaked to attain perfection consistently viz. FCR reduction, achieved by better genetics and better feed utilization strategies including gut health optimization via advanced feed additives. More interestingly Advanced Carbohydrase like Xylanase are helping us to improve the feed efficacy and saving for the producers on the one side and lesser feed consumed per KG biomass on the other. So, we are saving the feed which in turn spares the area under cultivation, reduction in deforestation and many allied positive consequences interconnected to the humans, environment and animals and that I believe is truly a one health approach with sustainable advantage.

Phytogenic interventions from the stakeholders are one such example which are helping in reducing the rampant use of Antibiotics as growth promoters and checking the AMR vis-à-vis reducing the feed waste in faeces by improving the digestibility and gut microflora, low indigestible feed in faeces reduce unwanted bacterial fermentation and formation of gases like ammonia which negatively affect the respiratory health of the animals and the workers associated with it, however it may not be sufficient enough to clean the gases and may require other interventions in the form of litter management systems and engineering solutions to air quality challenges in livestock production.

One health for Sustainable food systems

It is a matter of prime importance to ensure the global health of both our people and our food systems and this major driving force is enhancing sustainable livestock pathways out of poverty in lower income countries. Farm animals continue to remain lifelines for most of the world's poor today—for their food, nutrition, farm and economic security. But livestock can also pose threats to human and environment health, and disease threats arising in poor countries know no borders. Only by supporting more efficient, safe, equitable and sustainable livestock systems of the poor will we be able to ensure healthier people, animals and environments.

Taking a multisectoral One Health perspective in food systems facilitates policy and investment solutions that look at the potential synergies and trade-offs from different investments rather than looking for parallel or one-size-fits-all solutions. It also moves the conversation away from binary diet choices – animal-sourced foods vs plant-based – highlighting instead the linkages between human, animal and ecosystem health and resilience.

As animal agriculture develops to meet the food supply needs of a growing global human population, intensification of production and other pressures such as land scarcity and proximity of farms and nearby communities raises questions about whether the One Health model for animal agriculture is both feasible and scalable. In other words, is it possible to raise an ever- increasing number of food animals while protecting the health of workers, consumers, and nearby communities as well as the welfare and health of the animals and the integrity of the local and global ecosystem? While such a goal may seem daunting, it is evident that finding ways for animal agriculture to address these simultaneous concerns will continue to grow in importance.

One Health approaches also usefully move conversations away from unproductive binary diet choices—whether to consume meat, milk and eggs or only plant-based foods, for example—and highlight instead the many close links among human, animal and ecosystem health and resilience, and how we can best manage those links for the good of all.

People are healthier, safer, and better off when their livestock and the animals around them are healthy. Detecting zoonotic diseases early and managing them effectively before they jump to people is essential.

Keeping foods safe leads to healthier people, livestock and environment

People are healthier when their food is nutritious, safe from germs and chemicals, and is handled in clean environments. People's lives and livelihoods directly benefit from investments in the health and welfare of their livestock. Good animal health and welfare also safeguard national economies from trade restrictions and bans.

Ensuring, One Health approach is essential for progress to anticipate, prevent, detect and control diseases that spread between animals and humans, tackle antimicrobial resistance, ensure food safety, prevent environment-related human and animal health threats, as well as combatting many other challenges.

The world today is empowered with science technology research manpower and capital, but a famous quote "With great power comes great responsibility" from a famous movie Spiderman fits apt in current scenario

All these powerful synergies between animal health, public health and environmental specialists, applied at a local, national and global level, will undoubtedly contribute to the constant, responsible and simultaneous improvement of public health and animal health worldwide.

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UTTARA IMPEX PVT. LTD. has set-up an Advanced Nutrition Lab for the Indian poultry farmers to help them to analyse the raw material and poultry feed. The laboratory is equipped with an Advanced FT-NIR machine, Toxin Analyser and Advanced Protein Analyser.

TESTS CONDUCTED AT THE LAB

Amino Acid Profile	Moisture	Calcium	Thirum
Apparent Metabolisable Energy [AME]	Crude Protein	Magnesium	Aflatoxin
Total Phytic & Available Phosphorous [TPP]	Crude Fat	Salt	Ochratoxin
Total & Standardised Ileal Digestible Amino Acids [TDAA]	Crude Fiber	Soluble Protein	T2 / HT-2 Toxin
	Total Ash	Urease Activity	Zearalenone
	Sand & Silica		
	Total Phosphorus		

Contact Details:

Mr.Shankar Reddy: **8008802148** / Mr.Vijay Kumar: **8008101670**

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SPIRULINA IN POULTRY DIET- A NEW APPROACH

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Highlight Points

1. The increasing demand for human protein food sources has resulted in a need for new feed materials which provide a safe source of nutrients for poultry and livestock.
2. Alternatives to antibiotics, growth hormones and other chemicals are becoming increasingly popular in poultry nutrition currently. The cost of traditional ingredients like maize has risen dramatically in recent years.
3. Spirulina is an edible blue - green microalgae. It is a good source of protein, essential amino acids, vitamins and minerals for poultry diets, with no detrimental effects on health or growth performance; hence, spirulina cultivation is becoming more popular around the world.

Introduction

Demand for animal products is increasing because of global changes in consumer tastes and expanding markets, particularly in developing countries where affluence is spreading. However, two key obstacles must be overcome before this projected demand can be met: (i) increased competition for land, with urban sprawl, biofuel production and other agricultural applications taking up land otherwise used for animal production and (ii) climate change negatively affecting water and animal feed availability in current production regions.

The identification of new feed resources is therefore crucial for sustainable animal production and future viability. Ideally, the new feed resource should have high nutritive value and conversion efficiency, be able to optimise animal product quality and use land and water efficiently. The current trend in poultry nutrition is to use natural ingredients as an alternative to antibiotics, growth factors or other chemicals. Consequently, Spirulina is emerging as a potential source to meet these criteria.

Spirulina is an edible blue - green algae rich in protein content, vitamins, minerals and phyto pigments. It can be produced in marine or freshwater aquatic systems, with marginal land requirement, which reduces the conflict of using limited farmland in cultivating animal feed. Spirulina is currently presented as an effective alternative dietary source to substitute the costly supplies of fishmeal and fish oil required in the poultry diet.

Historical background of Spirulina

Spirulina (Arthrospira spp.) is an edible, filamentous, spiral - shaped cyanobacterium, formally classified as a blue - green microalga. It is naturally found in the alkaline lakes of Mexico and Africa, where it has a long history as a food source for their ancient human inhabitants. Spirulina was 'rediscovered' relatively recently by Leonard and Compere in the 1960s and has since become a mass - produced product. Presently, Spirulina is commercially produced worldwide and is used as a nutritional supplement for both humans and animals, with approximately half of the total Spirulina production being used in livestock and fish feeds.

Current status

Spirulina is produced commercially within a nutrient - rich, liquid medium; hence, it can be produced with high land - use efficiency. For instance, Spirulina out yields many other traditional animal feed types, including wheat, corn, barley and soybeans, in protein output per land unit. Furthermore, Spirulina can be actively produced using desalinated

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wastewater and animal faecal wastes to enrich the growth medium. Currently, Spirulina is relatively expensive to produce and purchase compared to other animal feeds. This makes its use impractical in many large - scale animal production operations.

Additionally, Spirulina's palatability, dried powdery form and smell all limit its use for animal consumption. However, Spirulina's production cost can be lowered with developments in low - cost growth media and an improvement in the operational management of Spirulina's nutrient - use efficiency and growth rate. Furthermore, research into Spirulina delivery methods and its impact on product quality is increasingly allowing us a greater understanding of the practicalities of its use.

Nutritional value of Spirulina:
Spirulina is nutrient rich. It contains all essential amino acids, vitamins and minerals. It is also a rich source of carotenoids and fatty acids, especially γ-linolenic acid (GLA) that infers health benefits. It is also a good source of pigments, such as chlorophyll a, phycocyanin, carotenes and xantophylls. However, Spirulina's high protein content distinguishes it as a new animal feed.

Table on proximate principle of Spirulina:

Proximate	Amount (%DM)
Moisture	4-9 %
Fat	4-16%
Protein	60-70%
Ash	3-11%
Carbohydrates	14-15%
Energy	1504kJ/100g
Crude fibre	3-7 %

Spirulina in chicken diet:
It is apparent that the impact of dietary inclusion of Spirulina on chicken growth and growth rates depends on the feed type it replaces in the ration. Although it has been shown that dietary Spirulina levels of 50 - 100g / kg of feed ration will maintain typical growth rates, levels exceeding 200g / kg will bring about declined growth rates.

Cultivation of spirulina:
Grown in hot tropical climate which is the best for its cultivation. In India, it is grown mainly in south India mainly Tamil Nadu. It requires a pool or container placed in yard or on a balcony, windowsill or roof Spirulina needs sunlight. Ideal temperature for growth is 30 to 35. The production of spirulina is around 100 to 130 kg per month. Dry spirulina powder in the market will fetch about Rs 600 / kg.

Advantages of spirulina :
- Dietary Spirulina has been associated with greater cost - efficiency in chicken production. It is found that vitamin - mineral premixes normally added to chicken feed rations can be omitted when Spirulina is included, owing to its nutrient - rich composition.
- Spirulina is very rich in protein and may be used as partial replacement of conventional protein sources, such as soybean meal.
- Furthermore, chicken receiving dietary Spirulina have been found to be of better health than their unsupplemented counterparts. This is attributable to increased functionality of macrophage and overall mononuclear phagocyte system indicative of enhanced disease resistance with increased dietary Spirulina levels in chickens found improved chicken health with low dietary Spirulina levels of 10g / kg in the ration, indicating greater production cost - efficiency.
- Spirulina has been shown to be an effective means of altering of chickens product quality to meet consumer preferences. For instance, the total cholesterol content of eggs can be lowered by including Spirulina into layer birds rations. This is mainly attributable to Spirulina's high antioxidant and omega - 3 polyunsaturated fatty acid (PUFA) content that enriches the nutritional value of eggs at the expense of cholesterol content.
- Egg yolk colour has also been found to intensify linearly with increased dietary Spirulina levels. In White Leghorn layer hens, dietary Spirulina levels of 3 - 9% of the total ration were found to result in egg yolk colours best representative of consumer preferences.

Conclusion
Spirulina is a natural feed that includes necessary amino acids, vitamins and other minerals for poultry growth.The use of Spirulina as a feed has already resulted in increased production, meat and egg quality.Because of its health benefits, Spirulina might be a viable alternative for poultry feed.

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Potential of Essential Oil Blend in Poultry Production

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Highlight Points

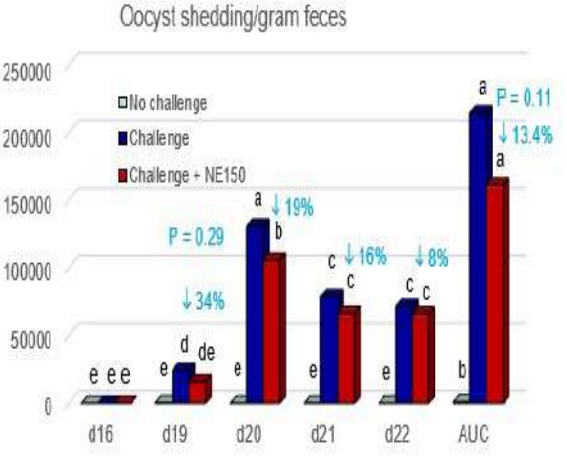
Essential oils (EOs) are important aromatic components of herbs and spices and are used as natural alternatives for replacing antibiotic growth promoters (AGPs) in poultry feed as these have antimicrobial, antifungal, antiparasitic and antiviral properties. Beside, other beneficial effects of EOs include appetite stimulation, improvement of enzyme secretion related to food digestion and immune response activation. However, it appears that the degree of response may be influenced by the level and type of EO used and the health status of the animal. In vitro and in vivo studies showed that specific EO blends may help to reduce incidences of subclinical necrotic enteritis and coccidiosis.

The efficient conversion of feed into its basic components for optimal nutrient absorption is vital for both broiler and broiler breeder production and welfare. Gut health, an intricate and complex area combining nutrition, microbiology, immunology and physiology, has a key role to play. When gut health is compromised, digestion and nutrient absorption are affected which, in turn, can have a detrimental effect on feed conversion leading to economic loss and a greater susceptibility to disease.

The industry has made huge efforts in recent years to develop solutions focusing on gut health. This is not only due to a direct link to improved feed efficiency and profitability, animal welfare or food safety, but also due to changes in consumer preferences and regulatory requirements.

When it comes to poultry gut health, coccidiosis and necrotic enteritis are major economic challenges, particularly when present in a subclinical form where symptoms may not be observable. Due to epithelial damage and inflammation, these subclinical infections reduce feed efficiency and result in an opportunity for potential pathogens.

Poultry trials challenged with Eimeria and Clostridium perfringens showed that NEXT ENHANCE 150 feed additive – an encapsulated, highly concentrated blend of thymol with carvacrol – promotes healthy intestinal microbial flora, as well as supports gut barrier function, inflammation processes and immunity. NEXT ENHANCE 150 has a positive effect in the reduction of coccidial faecal oocyst shedding and minimizes damage to intestinal epithelium in infected birds. Use of NEXT ENHANCE 150 for reduction in coccidial oocysts in excreta could lead to the development of new strategy for the prevention of avian coccidiosis.



Coated essential oil blend –protected for better performance:

Where essential oils are concerned, thymol and carvacrol are scientifically well-documented compounds. Due to their phenolic structure (having a cyclic ring with a hydroxyl group attached) they are recognized as efficient compounds showing a variety of beneficial effects in the gut. NEXT ENHANCE 150 (NE150) is a highly concentrated blend containing thymol and carvacrol protected by a unique coating. This ensures that the active ingredients are stable during pelleting and can ultimately result in a controlled release to the lower parts of the intestinal tract.

Multi-faceted approach:

Thymol and carvacrol are highly effective against a wide range of potential pathogens. In a variety of studies, NE150has demonstrated its potential to establish a healthy microbial composition by promoting higher lactic acid-producing bacteria and reduce pathogenic species. An example of the antimicrobial effects in broilers is shown in Figure 1.

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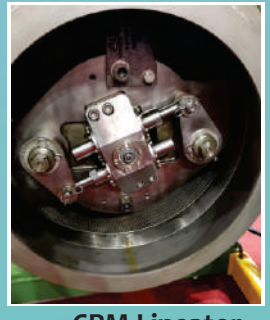

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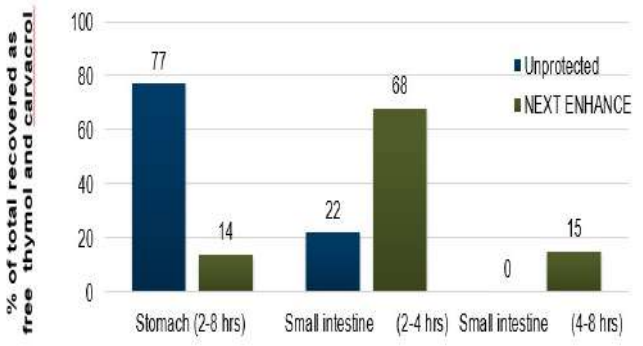

NEXT ENHANCE® is a unique patent-pending protection system which directs targeting of active ingredients

In the study, an Eimeria challenge model was used, which typically increases the levels of C. perfringens. It is well known that C. perfringens is the causative agent for necrotic enteritis but requires other predisposing factors to become clinical or subclinical. The invasion of intestinal cells by the Eimeria parasite is seen as the major predisposing factor because it creates tissue damage and leakage of plasma proteins used by C. perfringens. Broilers, receiving NE150 showed lower levels of C. perfringens as well as lower levels of Enterobacteriaceae, a large family of pathogens including E.Coli or Salmonella. As a result, NE150 is shown to lower the risk of a bacterial overgrowth, which is key in he development of necrotic enteritis.

Figure 1: Reduction in caecal C. perfringens & Enterobacteriaceae8 days post-challenge with Eimeria

Biomarkers can be used to study the effect of protected thymol and carvacrol on intestinal integrity and gut barrier function. The stability of the tight junctions (a unique connection between cells), for example is linked to the amount of occludin, which increases the physical barrier function of the intestine. Under challenge conditions and during inflammation processes, occludin is known to be down regulated. A broiler study with C. perfringens challenge showed lower levels of occludin, which increased with the addition of NE150. This lowers the risk of pathogen translocation, or the uncontrolled transfer of different molecules from the lumen into the bloodstream. It has also been shown that broilers receiving NE150 under Eimeria or C. perfringens challenges showed significantly lower serum endotoxin levels, indicating improved mucosal barrier integrity. Adding NE150 to the ration has also shown increased villus height to crypt depth ratio, another well recognized marker for intestinal health. Macroscopic intestinal lesions are another relevant indicator of gut health. In Eimeria and C. perfringens challenge studies, these lesions were significantly reduced with NE150.Fewer intestinal lesions can result in a lower inflammation processes and can directly translate to performance improvements.

During a host-pathogenic infection, pro-inflammatory cytokines are released to activate the immune system. However, the inflammation needs to be controlled as a prolonged and persistent activation of pro-inflammatory cytokines can result in mucosal damage as well as impact the stability of tight junctions. The inflammation also consumes a lot of energy, which impacts performance. NE150is shown to down regulate pro-inflammatory cytokines, which helps to protect intestinal barrier function and save energy. Conclusively, thymol and carvacrol lower the risk of performance depression and intestinal damage caused by inflammation.

Thymol and carvacrol are also known to have anti-oxidative capacities due to their chemical structure. To understand how NE150 could benefit broilers' oxidative status, a study was done measuring various biomarkers, such as super oxide dismutase (SOD) and glutathione peroxidase (GSH-Px). These enzymes are responsible for the conversion of reactive oxygen species (ROS) to harmless substances. ROS are a result of normal metabolism but are toxic to the organism and increase significantly during an infection or stress. It was shown that both enzymes increased (Figure 2) when NE150was added to the diet. As a result, the malondialdehyde levels, a marker for lipid peroxidation, were significantly reduced in broilers. NE150 can therefore, directly and indirectly, help to maintain a balance between ROS and the defense system, which lowers the risk of tissue and cell damage as well as performance losses.

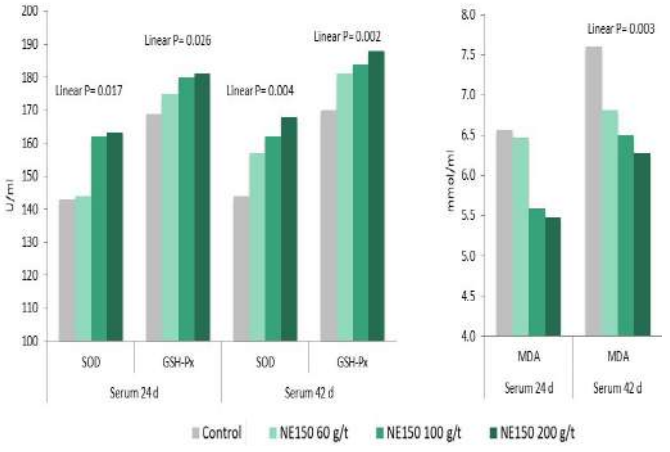

Figure 2: Improved antioxidant status

Consistent performance improvement:

With its broad impact on gut health it is not surprising that broilers receiving NE150 show a consistent improvement in feed conversion ratio with an average of 3.7% when used at the recommended dosage rate. In addition, NE150 can be used in feeding programs to support the birds under coccidiosis, necrotic enteritis or gut health challenges to help alleviate negative effects on the animals.

This array of trials shows that producers can use NE150 in their strategy to improve feed conversion ratio, thereby reducing production cost efficiently and increasing the profitability of commercial broiler productions.

References available upon request

The Best Defense for Layers

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Author: *Dr Jordon Gruber*

Highlight Points

1. **As the key system for converting feed into protein, a chicken's gut links directly to nearly all growth and production parameters. Research has shown that the higher the intestinal lesion score, the greater the energy and protein spent on fighting diseases.**
2. **The populations of beneficial or potentially harmful bacteria present in the gut are also a key indicator of bird health. Beneficial microorganisms residing in the gastrointestinal tract work to inhibit colonization and growth of potential pathogens, support immune development and provide nutrients to the host.**
3. **As the dtemand for cage-free eggs continues to soar and producers work to navigate an antibiotic-free production model, gut health is emerging as a leading factor in the maintenance of optimal bird performance.**
4. **Promoting fast development of the microbiota in the first 21 days is an effective strategy for achieving health and performance goals.**

Jordon earned his Bachelor's degree in Microbiology from Clemson University and his PhD in Biochemistry from the Medical University of South Carolina, where he studied host - pathogen interactions. Jordon also completed Post-doctoral training investigating DNA repair mechanisms in relationship to cellular growth.

Apart from his academic training, Jordon has consulted for a number of start – up biotechnology companies and has served on several advisory committees for government and non - profit groups. Jordon comes to Danisco Animal Nutrition – now part of IFF – from his own successful biotechnology start – up company that engineers antimicrobial solutions for animal production.

Introduction:

The layer industry is transforming with the consumer-driven shift to cage-free eggs in many parts of the world. More than 200 different retailers, including McDonald's, General Mills and Wal-Mart, have announced their intent to purchase only cage-free eggs in the future. Meeting this demand will require a sharp increase in housing square footage due to lower density, which will involve costly investments into cage-free housing.

Currently, approximately 42m layers can meet the industry's demand for cage-free eggs — that's14% of all layers in the US. That number is expected to grow to190m by 2025.

With the transition to cage-free production, gut health and farm management will play an even more vital role in maintaining good bird performance. Innovative new strategies must be used to quell disease and boost performance.

These emerging strategies focus on moving from the direct effect to anti microbials to the indirect effects that come from stimulating immune development and supporting the establishment of a beneficial microbiota.

Production Considerations of Cage - Free

Cage - free layers present several unique production challenges, perhaps most notably a decrease in feed conversion due to increased movement, an increase in wasted feed and a greater requirement for calcium. Uniformity is a concern, a result of increased movement and bird-to-bird variations in feed consumption. Cage-free production also requires a greater focus on maintaining litter quality and ventilation in order to avoid caked, wet litter which would encourage greater microbial growth with increased food safety and laying hen disease risks.

In cage-free production, disease becomes more easily transmissible within a flock due to increased movement, bird-to-bird contact and litter exposure. Free-range, cage-free birds face even more health challenges as the result of being exposed to higher bacterial and viral loads in the outdoors. Improved gut health has the potential to aid in a bird's ability to maintain performance while managing these various challenges.

Diverse and Evolving Health Challenges:

The move to cage-free will cause producers to revisit diseases of years past. Gut health challenges including Necrotic Enteritis (NE) will become optimal performance risks. Caused by the bacterium Clostridium perfringens and coupled with other challenges like coccidiosis and undigested nutrients, NE causes lesions in the bird's intestine and in severe cases can lead to increased mortality.

In its sub clinical form, NE can cause significant reductions in bird performance. NE alone was estimated to cost the poultry industry $2 bn in 2015.

Cage-free producers will also face serious issues with Escherichia coli and zoonotic pathogens including Salmonella and spirochetes. These pathogens not only have the power to impact bird performance, they present serious food safety concerns, of which the consumer does not expect to assume any risk. Controlling the type and number of oocysts is essential for mitigating gut damage caused by coccidiosis.

The Gut's Effect on Bird Performance:

The basis of scientific understanding begins with the gastro intestinal tract because gut health is the foundation of every successful poultry operation. As the key system for converting feed into protein, a chicken's gut links directly to nearly all growth and production parameters. Research has shown that the higher the intestinal lesion score, the greater the energy and protein spent on fighting diseases. Energy and protein spent fighting diseases detracts from bird growth and performance.

As one of the largest areas exposed to foreign materials like microbes and feed, the gut serves as the front line of a bird's health defense. A healthy gut is therefore vital for overall bird health and performance. Some of the key indicators of a healthy gut include increased villi height to crypt depth ratios for maximum surface area for nutrient absorption and good gut integrity (trans epithelial electrical resistance or TEER) to keep those microbial populations in the gut lumen.

The populations of beneficial or potentially harmful bacteria present in the gut are also a key indicator of bird health. Beneficial micro organisms residing in the gastro intestinal tract work to inhibit colonization and growth of potential pathogens, support immune development and provide nutrients to the host. However, chicks do not hatch with an established microbiota; its establishment takes time and this makes the chick more vulnerable to infection pressures.

At hatch, bacteria begin to colonize the gastro intestinal tract, but the process can be greatly influenced by conditions in the hatchery as well as the process of transport and handling. By day seven, the intestinal bacteria population has grown 10 fold. At around 21 days, the microbial population in the small intestine is largely established (tfig.1). The microbiota in the distal gut takes more time to develop due to its complexity.

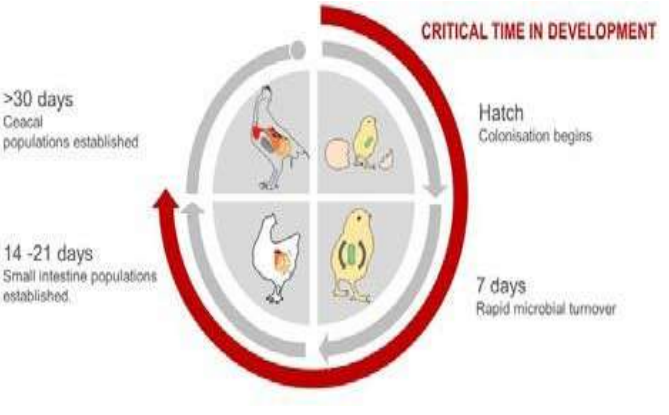

Figure 1: Process of gut development in broiler chickens. The first 21 days are critical for microbial development

Optimizing Gut Health with Probiotics:

Producers must find ways to balance productivity with animal health and help birds to win the battle of the gut against harmful bacteria. The rapid development of a healthy, mature microbiota is an essential aspect of this battle. Research has shown that feeding probiotics from day 1 promotes the quick establishment of a positive microbiota and guards against colonization by coliforms, such as E. coli, which may have a negative impact on performance. Even with an established gut microflora, mature birds can experience changes in the microbiota population due to many different nutritional, environmental and disease factors. This makes continued use of probiotics valuable in supporting ongoing bird health and performance.

Due to the diversity of pathogenic threats, identifying the most beneficial probiotic presents a challenge. Not all probiotic strains have the same mode of action. Not all are effective against the same threats; nor do they defend birds in the same way. All of this means that when using probiotics to defend against diverse pathogens, it is often beneficial to use a similarly diverse probiotic.

After analysis of over 80,000 gut samples at over 500 farms worldwide, a three-strain Bacillus probiotic was isolated in the poultry environment. It has been shown to have a positive impact on gut health. The three-strain Bacillus, Enviva PRO, strengthens the gut structure, slows the growth of non-beneficial bacteria and encourages the growth of beneficial bacteria. In one trial, Enviva PRO was shown to inhibit the growth of all E. coli strains by up to 87% (figure2).

In addition, these three Bacillus strains accelerate the natural gut maturation process delivering a more mature gut by 21 days of age, allowing the bird to gain maximum benefit from a mature gut for a longer period in the production life cycle.

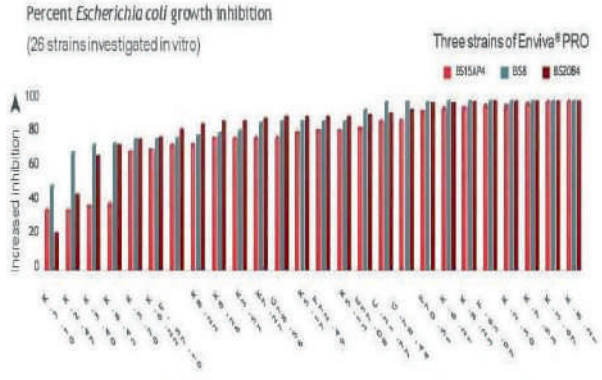

Figure2.Enviva PRO, three unique strains, shows significant growth inhibition across diverse E. coli (26 strains collected from infectious episodes in commercial farms; investigated in vitro)

Multiple Modes of Action:

The three strains of Bacillus in Enviva PRO are spore formers, which mean that they can survive extreme heat, pH and starvation conditions. Together, they work to improve gut health in six key structural and micro biological areas. The three strains in Enviva PRO have been shown to promote immune development, reduce the risk of inflammation during periods of change and strengthen the gut structure. In addition, they support the development of a positive microbiota while inhibiting the colonization of non-beneficial microbes and producing antimicrobial compounds. Specifically, Enviva PRO has even been shown to increase beneficial bacteria, such as Lacto bacillus, while decreasing non-beneficial bacteria, such as Campylobacter. It has also been shown to be effective at inhibiting Clostridium growth. In vitro, all three Bacillus strains in Enviva PRO were shown to inhibit the growth of multiple Brachyspira Pilosicoli with performance superior to other Bacillus strains (figure3).

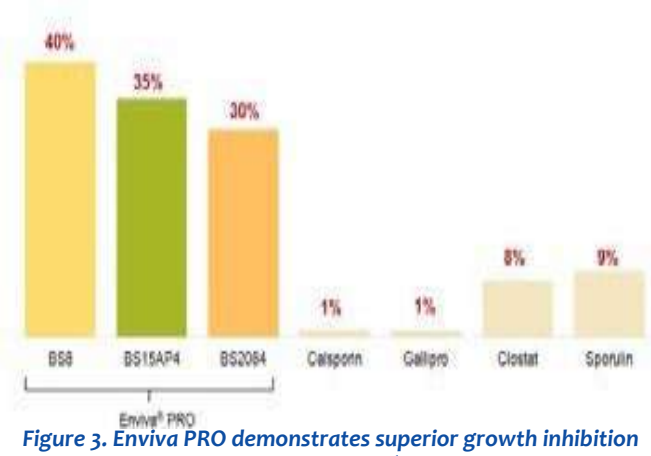

Figure 3. Enviva PRO demonstrates superior growth inhibition against typical Non-beneficial bacteria (Brachyspira Pilosicoli 898; % of control; in vitro)

Responding to Diverse Production Challenges:

As the demand for cage-free eggs continues to soar and producers work to navigate an antibiotic-free production model, gut health is emerging as a leading factor in the maintenance of optimal bird performance. Promoting fast development of the microbiota in the first 21 days is an effective strategy for achieving health and performance goals. In addition, continued probiotic use throughout the lay cycle has been shown to improve gut health and energy utilization while inhibiting Campylobacter Spp colonization. As with all interventions, the use of probiotics is most helpful in combination with good animal husbandry and care.

(References: Can be provided on Request)

Check, Assessment and Revalidation of Standard Botanical Powders

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Environmentally conscious consumers place a premium on global sustainability, animal welfare and obtaining better food for their families, driving them to solely purchase organic items. This segment of the population has grown at an exponential rate over the last decade and their numbers are continuing to rise. According to reports published by Business Wire, the global organic meat products market is expected to grow from $14.38 billion in 2019 to $20.39 billion in 2023. To meet this market demand, manufacturers must take on the task of producing higher - quality, consistently efficient, value delivering sustainable herbal products.

We explored what standardised botanical powders (SBPs) are, their value and the benefits they give to the poultry farming community in prior articles in this series. SBPs are herbal powders whose specific phytochemical active concentrations are standardized with minimal variation, to ensure efficient Phyto active function in the animal's body. Through standardization of botanical powders, the product can be monitored for consistency, and it provides the expectedand desired results for the animals.

Consistency in efficacy is crucial in today's poultry sector and the usage of SBPs will help with that. In previous articles, we discussed the scientific foundation to produce SBPs as well as the protocols that must be followed to ensure that the active phytoconstituents remain of high quality. It's crucial to keep the herbal constituents stable in a poly - herbal composition. Environmental factors such as humidity, air, light and temperature can affect stability. Stability is further affected by factors such as particle size, pH, the characteristics of water and other solvents used during manufacturing, the nature of the container and the presence of other chemicals resulting from contamination. Maintaining an SBP's stability ensures that the product's strength, quality and purity remain consistent as per specifications. In the current article, we shall shed light on the desired botanical, organoleptic, physical, chemical and biological properties of SBPs that make them stable and maintain high quality.

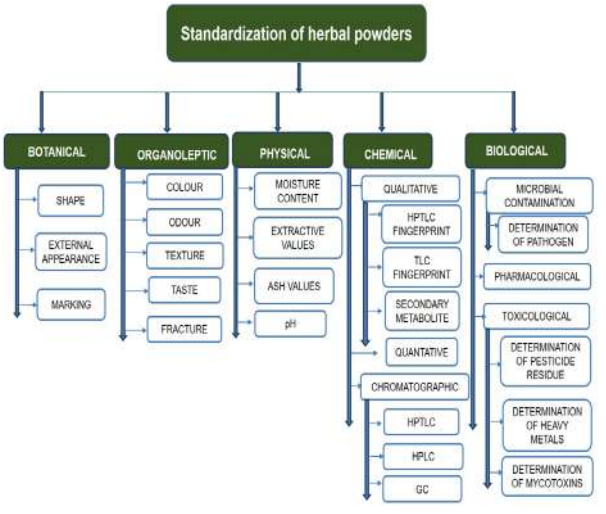

Figure 1: The many assessments that an SBP must go through are depicted in this schematic representation.

SBPs should be assessed and documented for their properties
SBPs should be thoroughly studied for their inherent properties as shown in Figure 1.
Botanical properties such as physical shape, external appearance and markings should be documented.

Organoleptic properties are properties that create an individual experience through the senses of the consumer. These properties are colour, odour, texture, taste and fracture.

Physical attributes such as pH, moisture content, ash value, which is the inorganic residues obtained after complete combustion of a compound and extractive values are used to assess quality, purity and to detect adulteration.

Chemical properties should be assessed through high - performance liquid chromatography (HPLC), high performance thin layer chromatography (HPTLC), thin-layer chromatography (TLC), and gas chromatography (GC). The SBPs should be analysed both qualitatively and quantitatively for their chemical properties.

Biological properties should be studied for microbial contamination, toxicological and pharmacological residues.

The next sections go through some of the key attributes that contribute to the making of an efficient SBP.

Assessment of the particle size of the SBPs:

Poultry are simple stomached animals largely dependent on the repertoire of endogenous enzymes for their nourishment. One of the most critical aspects that determine feed utilisation in these animals is particle size distribution. Finer particle size provides for better contact with digestive enzymes, which results in optimal nutrient absorption and improved animal performance. However, the fineness of the particle size has limitations. Increased incidences of gizzard dysfunction are seen in the flock when the particle size is very fine. Hence, during the manufacture of SBPs, the particle size of the product plays an integral role.

Particle size can be assessed using a particle size analyser, as in Figure 2, which works on the principle of laser diffraction. Large particles scatter light at small angles as compared to that of the laser beam, whereas small particles scatter light at a much larger angle. The angular scattering intensity is used to determine particle size. The flow of the SBP particles should be assessed for parameters such as the angle of repose, which is a characteristic related to inter-particulate friction or resistance to movement between particles, the compressibility index, and Hausner ratio. In Figure 3, the particle sizes of three products, A, B and C, are compared.

While they are all in powder form, higher magnification reveals that product A has the best particle size when compared to B and C. The ability of a product to be homogeneously blended into the feed mixture is also influenced by particle size. Hence, as indicated in Figure 4, an SBP must be examined for its capacity to be uniformly mixed.

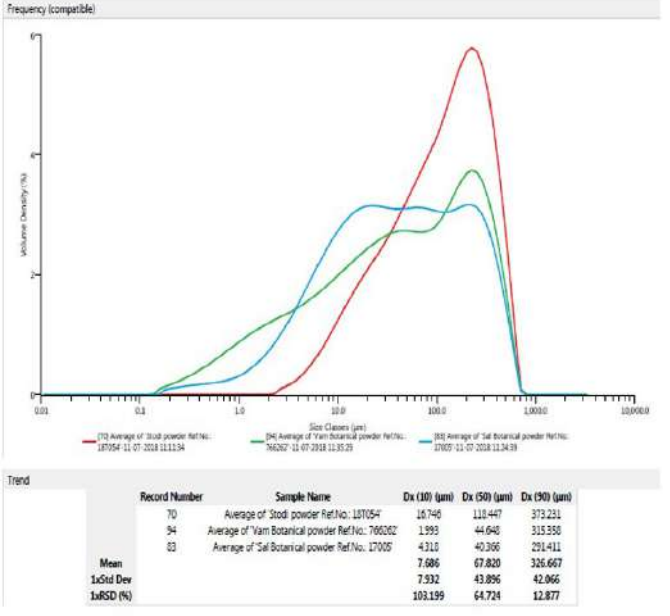

Figure 2: Particle size analyser results

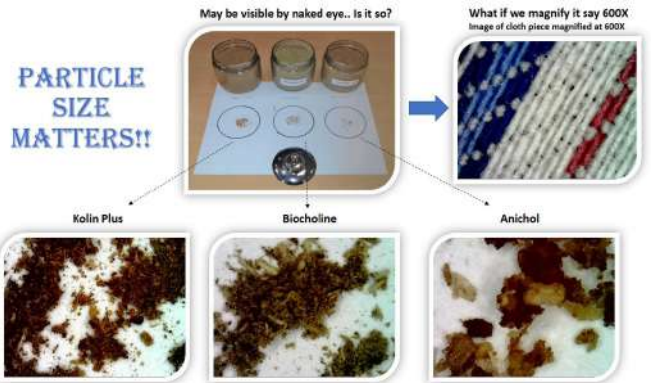

Figure 3: Particle size of different products shown at higher magnification.

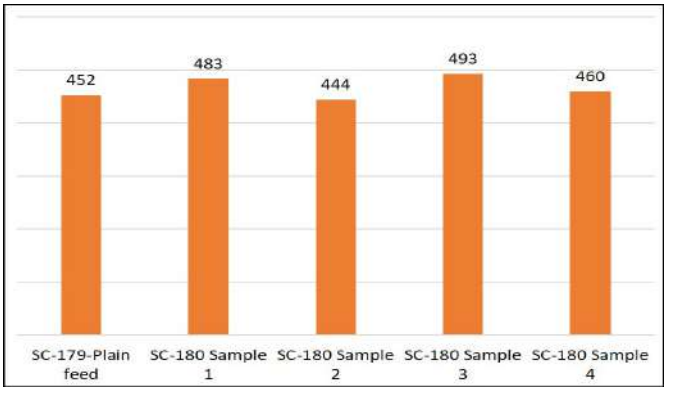

Figure 4: Assessment of uniform mixing of the SBP with other feed ingredients.

Thermostability assessment

It has been observed that, under higher temperatures, many of the constituents present in poly-herbal formulations may react with each other, raising serious concern about the stability and efficiency of the formulation. Natural products are often susceptible to deterioration, especially during storage, leading to the production of metabolites with no activity, loss of active phytoconstituents and in extreme cases, the production of toxic metabolites. Hence, qualitative, and quantitative evaluation of SBP stability at higher temperatures is essential. In Figure 5, the product under test doesn't show any change in the active ingredient composition before and after being autoclaved at 121° C, indicating that the compound is thermostable. These results ensure that the SBP is stable and will have the desired biological activity in the target animal.

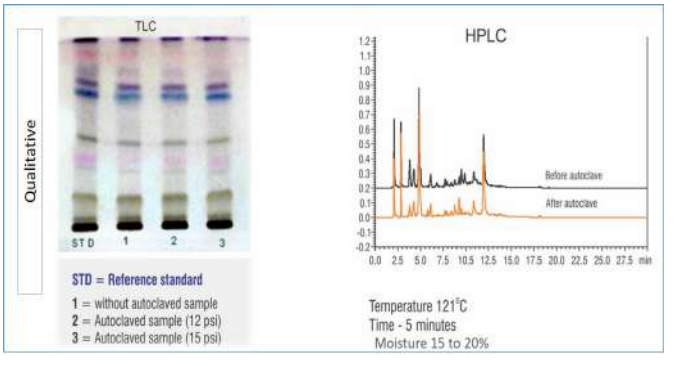

Figure 5: Thermostability assessment for the SBP both qualitatively and quantitatively. SBPs should be thermostable.

Microbial Load Assessment:

Herbal plants may be associated with a broad variety of microbial contaminants transmitted through soil or air as illustrated in Figure 6. They could be bacteria, fungi or viruses. Multiple environmental conditions influence the microbial load, which has a significant impact on the overall quality of herbal goods and preparations. According to study reports, the most found pathogens are enterobacteria such as E. coli and Salmonella. Hence, microbial assessment of medicinal plants on procurement and SBPs after manufacturing is essential. ISO guidance suggests standardized protocols for aerobic mesophilic bacteria, yeasts and moulds, E. coli and Salmonella in herbal medicines as shown in Figure 7.

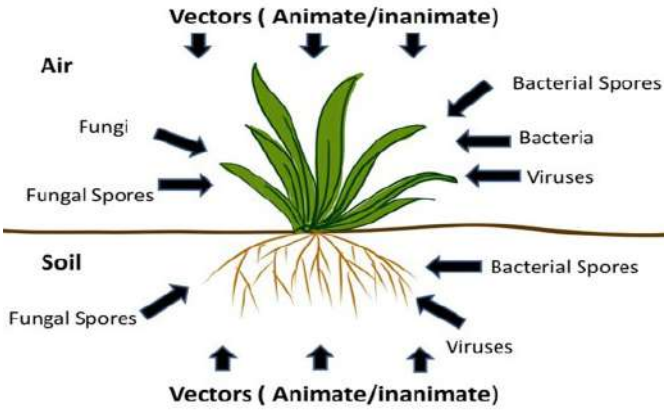

Figure 6: Schematic representation of the possible pathways of microbial contamination of medicinal plants

Figure 7: Microbial analysis of herbal products

Assessment for toxic contaminants:

Contaminants such as heavy metals, pesticides and mycotoxins, if not maintained below safe levels, can lead to life - threatening toxicity in animals. To ensure the SBPs are safe, they should be tested for these contaminants. The samples can be tested for pesticide residues with Gas Chromatography – Electron Capture Detector (GC-ECD) and Gas Chromatography-Tandem Mass Spectrometry (GC-MS / MS). Heavy metal contamination can be detected using an inductively coupled plasma mass spectrophotometer (ICP-MS). Aflatoxin and mycotoxins can be detected using high - performance liquid chromatography with fluorescence detection (HPLC-FLD).

Assessment of Hygroscopicity:

The SBPs should be non-hygroscopic, among other physical qualities. The ability of a substance to absorb moisture from its surroundings is known as hygroscopicity. It's an unfavourable feature since it might cause lumps and prevent correct mixing with other feed ingredients. As a result, the SBPs must be designed to be non-hygroscopic. Figure 8 depicts a method for determining hygroscopicity. Product A is less hygroscopic as compared to B since it doesn't form lumps.

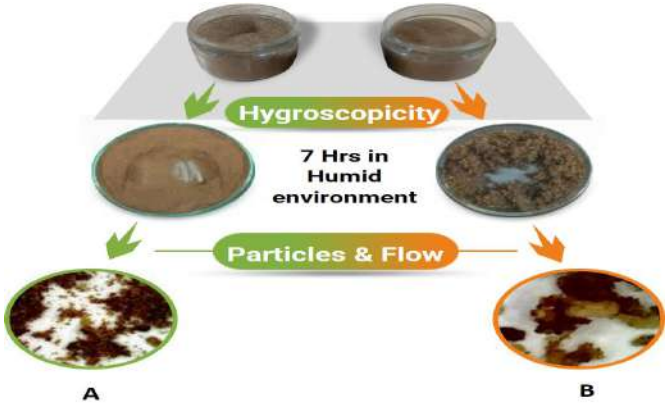

Figure 8: A test for the hygroscopicity of products A and B after 7hours of storage under high humidity.

The efficiency of a feed supplement can be attributed to its physical properties as well as its functional efficacy based on the performance of the birds. Here we elaborately provided evidence of the physical attributes necessary to be tested in an SBP, which would keep the product stable and efficient for a prolonged period as well as make management of the product easy. In our next article, Productivity Check of SBPs in the Field, we shall elaborate on the scientific assessment of functional efficiency through their biological effects.

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Published on 8 November 2021