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August 2018

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Soren Lundby

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Kemin hosts a seminar on Biosecurity: Profit beyond Production

A comprehensive Survey of Mycotoxin Prevalence in India (2017-18)

Lipid Evaluation Discloses Volatile Energy of Fats and Oils

Minerals, Vitamins and Their Interactions in Poultry

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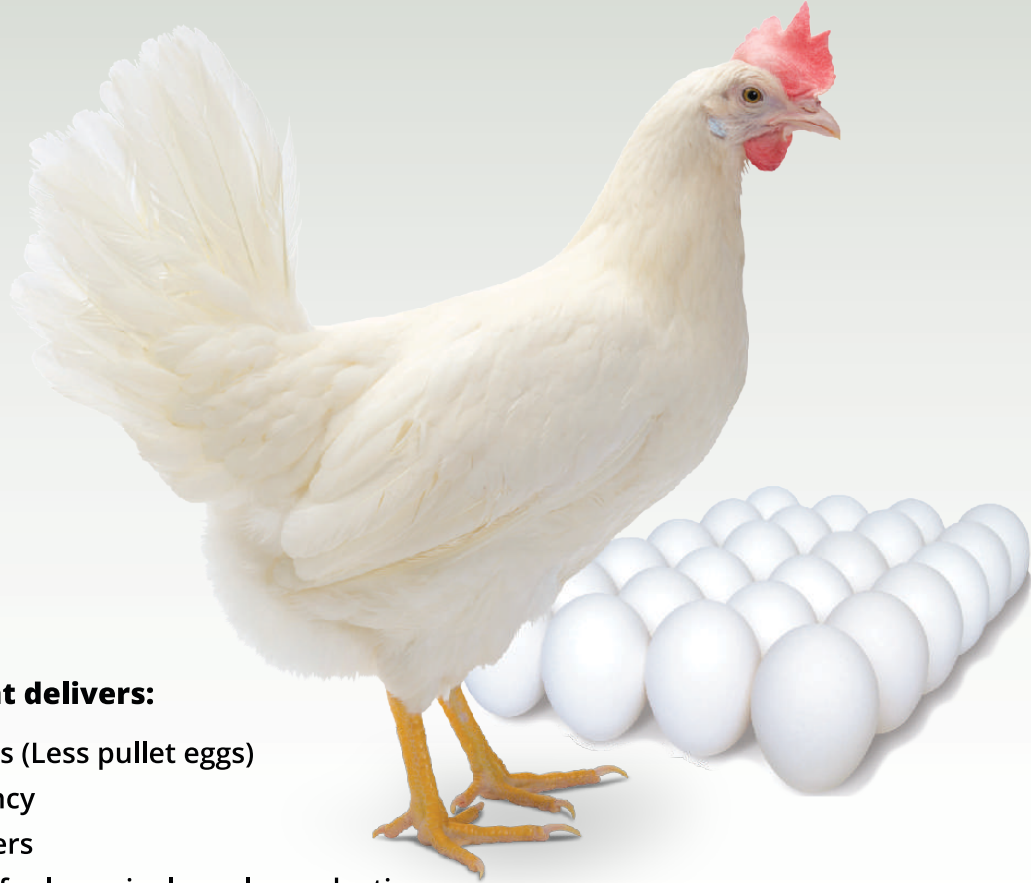
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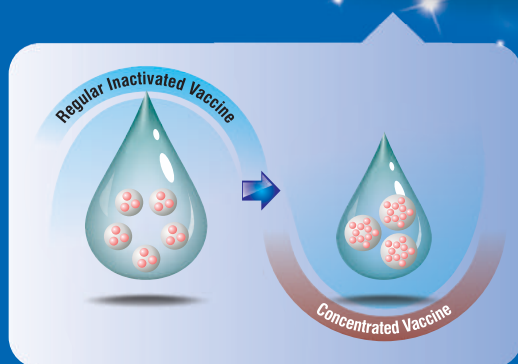
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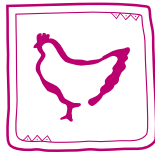
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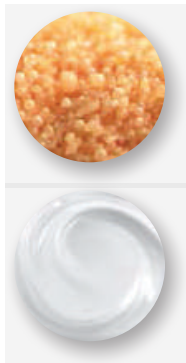


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- Editor



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Layer Farmers worry on Piling up of Egg Stocks



M.A. Nazeer

Dear Readers,

The August 2018 issue of *Poultry Fortune* is in your hands.

Layer farmers are finding it difficult as Eggs are piling up in lakhs in the farms. Many of the farmers in Hyderabad are not able to send and sell eggs outside Hyderabad. One of the reasons the layer farmers feel for the present situation is too much of dependence on a few egg dealers and more production causing lack of egg movement from Hyderabad and other big

production centres in the country. Eggs are not loaded properly in the last week of July 2018 which resulted in piling up of eggs stocks up to 5 to 7 lakhs in some areas in Hyderabad alone.

A moderate size dealer lifts two loads (vehicles) of (3 lakhs) eggs in a day to send them out of Hyderabad, and it needs about 5 persons / labourers for loading and unloading of eggs. But, there are dealers lifting 8 to 10 loads with 12 to 15 lakh eggs each day – and it is very difficult to have over 35 labourers as traders are not well organized.

Some experienced farmers and traders strongly feel that a farmer with one lakh birds farm can easily manage and control the things. It is not possible to control the things if a farmer has lakhs of birds in capacity, provided he has sufficient infrastructure and man power. The farmers are also feeling that after the demise of B.V. Rao in 1996, there is no monitoring and control on poultry, and there is not a personality of his stature to give confidence, interact and work for the welfare of farmers in the country. We urge the stalwarts of the Indian poultry industry to review the situation and do something concrete sincerely.

Readers may find a Special Features published on Srinivasa Farms Pvt Ltd and Skov Asia.

In the News section, you may find news about: Mr Gangappa M.H, a poultry farmer from Muppadihatta Village Doddaballapura Taluk in Bangalore District, Karnataka, a shift from traditional agriculture to contract poultry farming turned out to be a boon. High production cost and insufficient fund almost forced Gangappa to find an alternate source of income. In fact, things went so sour that he even thought about discontinuing his primary activity which is farming and allied activities. However, fate had something different in store for him. In the beginning of 2008, he came across Mr K. S. Ashok Kumar, an agriculturist who has abundant knowledge and experience in farming as well as allied activities. Mr Ashok Kumar is also the founder of Maa Integrators, a Vencobb franchise which is known for poultry breeding and farming.

Kemin hosts a seminar on Biosecurity. The conference was followed by a two-day fun filled exploration of Issyk Kul lake and other local sight-seeing at Bishkek. The event had an interactive session among the guests and the three speakers. The program gained positive feedbacks from the customers.

The 2nd International Conference on Necrotic Enteritis held on July 11-12, Trouw Nutrition researcher Yanming Han presented findings of two trials from China and Canada. The trials evaluated the efficacy of combinations of feed additive solutions to support bird health and performance in the presence of a *Clostridium perfringens* type A challenge. The test results of the feed additive combination were compared to the performance of birds receiving an antibiotic growth promoter (AGP). According to the company, both studies found that birds receiving a combination of applied feed additives performed comparable to birds receiving an AGP.

Dr Mahesh P.S., Director of Central Poultry Development Organization & Training Institute, India was invited by VIV Europe-2018 and Dutch Poultry Federation to address on “Prospectus and Opportunities in Indian Poultry Industry” on June 20.

Wisium, a premix and specialised additives division of NEOVIA (France) organized a seminar.

In the Articles section, article titled “Early IBD Intermediate followed by Plus Vaccination proves effective in Improving overall Broiler productivity in high disease challenge areas of WB: A case study” by Dr B C Dutta.

Another Article titled “Minerals, Vitamins and Their Interactions in Poultry” by 1. Dr R. Shirisha, 2. Dr A.Vidya, 3. Dr M. Rajashri and Dr Razia Sultana discussed “the nutritional importance that may be attributed to these inter-relationships depends on the levels considered to be physiological for each nutrient, and on their maintenance at acceptable levels in tissues for the defense of the organism. • This interaction occurs in different ways, i.e. starting from the action of vitamins on mineral metabolism, from the action of both types of nutrients in the protection of the organism, and from the action of minerals on vitamin metabolism. • The most significant example of vitamin action on mineral metabolism is the role played by vitamin D in calcium and phosphorus metabolism. The interrelationship of vitamin C and some minerals is also discussed, with emphasis on its relationship with iron. • With respect to the synergistic action of vitamins and minerals in the defense of the organism, we comment on the main data reported on the biochemical physiological role of vitamin E and its interaction with selenium”.

Article titled “A comprehensive Survey of Mycotoxin Prevalence in India (2017-18)” by Nidhi Madnawat, Shiv kumar, Rajesh K Kharvi and Manish Kumar Singh.

Another article titled “Lipid Evaluation Discloses Volatile Energy of Fats and Oils” by Chandrasekar S, Rengarajan S, Rahul Mathew and Snehal Tawde.


Article titled “Minerals, Vitamins and Their Interactions in Poultry” by Dr R. Shirisha, Dr A.Vidya, Dr M. Rajashri and Dr Razia Sultana.

Another article titled “Simulation of chicken probiotic biology: invitro vs invivo” by Dr Susim Mukul Ray

Readers are invited to send their views and comments on the news and articles published in the magazine and they would be published under “Readers Column”. Time to time, we shall try to update you on various aspects of poultry industry. Keep reading the magazine regularly and update yourself.

M. A. Nazeer

Editor, Poultry Fortune
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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 all in 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 India through annual Awards presentation.

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

Contract farming: A boon for small poultry farmers

Bangalore: For 45-year-old Mr Gangappa M.H, a poultry farmer from Muppadihatta Village Doddaballapura Taluk in Bangalore District Karnataka, a shift from traditional agriculture to contract poultry farming turned out to be a boon. After continuous crop failure and bearing heavy losses, he was in a crisis and not even close to break-even from his farming and allied activities. Sharing about their hard times, he says, "Coming from an agricultural farming activity, I have witnessed all kinds of trouble related to farming. I still remember the days of destruction due to drought and unseasonal rain followed by the pest attack, bore well failure, poor quality power supply etc many. On the other hand, the needs and demands of the family were mounting on day by day."

High production cost and insufficient fund almost forced Gangappa to find an alternate source of income. In fact, things went so sour that he even thought about discontinuing his primary activity which is farming and allied activities. However, fate had something different

in store for him. In the beginning of 2008, he came across Mr K. S. Ashok Kumar, an agriculturist who has abundant knowledge and experience in farming as well as allied activities. Mr Ashok Kumar is also the founder of Maa Integrators, a Vencobb franchise which is known for poultry breeding and farming.

Little did Gangappa know that this meeting would turn his life around. When he told Mr Ashok Kumar about his plight, then latter asked Gangappa to consider taking up contract farming. After days of being in a dilemma, he finally decided to give it a try and signed a contract with Maa Integrators. While initially, he was doubtful, months later Gangappa was more than happy with the decision he had made earlier. As time passed by, Gangappa's confidence multiplied and activities expanded with continued contracts connected with Maa Integrators.

Not only Gangappa, more than 100 such poultry farmers located at multiple locations are now under contract farming with Maa Integrators. Interestingly,

just like Gangappa, many of them were not initially convinced with contract farming as they could not foresee the benefits they would be getting.

Over the past decade, Maa Integrators has made a remarkable impact on the lives of numerous poultry farmers with its unique and inform contract farming model. Mr Ashok Kumar, who holds a master's degree



K.S. Ashok Kumar

inform techniques and innovative ideas. Periodical experiments with proper studies always kept Maa Integrators on track.

In poultry contract farming, the sponsor company enters into a contract with



Gangappa M.H. Poultry

in Agricultural Science and has over 30 years of experience in the agricultural industry, started Maa Integrators in 2007 when he realized how contract farming enables farmers to earn a sustainable source of income throughout the year. From the start, Maa Integrators had significant growth rate year-over-year with application of

an individual or/and group of farmers for rearing of broilers. Currently in India, broiler contract farming looks very attractive for most of the farmers in which they can easily earn their livelihood compared to other agricultural and allied activities, currently more than 70% of broiler is on contract broiler farming.

The company usually



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1 Perozo, F. et al (2008). Avian Pathology, 37:3, 237-245.

2 Merial internal data.

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**“
The initial capital expenses which come around 7 lakhs are carried out by the contract farming company.
”**

calculated in accordance with the payment schedule specified in the agreement. Performance based incentives is available

which makes farmers more encouraged; a win-win situation for both parties.

The proper implementation of contract farming can dramatically change the poor condition of small poultry farmers. “At Maa Integrators, we follow a very systemic procedure to make sure that the farmers are getting benefitted the most. Adaptation of advanced technology and a standard operating practice has attributed to our success”, Mr Ashok Kumar said.

Contract farming can be used as an effective tool for creating new market opportunities, essentially improving the quality of life of small poultry farmers.

The Indian market consumes 95% live bird, implying how lucrative the poultry industry is. By adopting Broiler poultry contract farming, the small farmers can generate



Poultry

**“
By adopting Broiler poultry contract farming, the small farmers can generate a gross income of more than 3 lakhs per annum in a small shed for 5000 birds.
”**

a gross income of more than 3 lakhs per annum in a small shed for 5000 birds. The initial capital expenses which come around 7 lakhs are carried out by the contract farming company. Moreover, the Centre recently unveiled the draft

Agricultural Produce and Livestock Contract Farming and Services (promotion and services) Act 2018”, which will help contract farming pick up more pace in the coming years as a panacea for growing farmers suicides.

Kemin hosts a seminar on Biosecurity: Profit beyond Production

Bishkek, Kyrgyzstan – Kemin Industries, a global leader in developing feed ingredients for animal nutrition and health, organized an exclusive seminar on Biosecurity and its importance for better production for select 21 key consultants. The event also announced Kemin’s entry into the farm health division. Kemin, a market leader in multiple feed additives, is planning to bring new farm health solutions to improve profitability for its customers. The highly differentiated efficient products will be supported by Kemin’s various service teams to overcome the shortcomings of current solutions in the market.

Dr Sudheer Rukadikar, Veterinary Pathologist based at Pune, with over 32 years of experience of Teaching, Research, Extension and Poultry Consultancy, shared important information on current health challenges in layer birds and practical solutions for the problems.

“Farm health is an integral part of profitable poultry production, we all must understand the Biosecurity ecosystem and its components” added Dr Ricardo Munoz, Director of Professional Services, Neogen Corporation Lexington, Kentucky Area, USA. He also introduced three novel solutions to the consultants- Kecedal™ T Plus, Kem V 260®, Trysil™ V Dr Saravanan Sankaran, Head- Technical Services, Monogastric, Kemin Industries South Asia shared insights on present and prospects of Biosecurity in India. He also discussed on an ideal Biosecurity plan for profitable business.

The conference was followed by a two-day fun filled exploration of Issyk Kul lake and other local sight-seeing at Bishkek.

The event was followed by an interactive session among the guests and the three-extraordinary speakers. The program gained positive feedbacks from the valuable customers.

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Controlling Enteric Challenges in Broilers: Feed Additive Combinations can Support Growth Performance and Health Comparable to In-Feed AGP

As antibiotic-free production systems become increasingly common in poultry operations around the globe, challenges such as Necrotic Enteritis require alternative solutions without compromising productivity and welfare. Research conducted by Trouw Nutrition finds that a combination of feed additives can support broiler growth performance and health at levels comparable to in-feed antibiotics, even when birds are exposed to a necrotic

type A challenge. The test results of the feed additive combination were compared to the performance of birds receiving an antibiotic growth promotor (AGP). Both studies found that birds receiving a combination of applied feed additives performed comparable to birds receiving an AGP.

Two studies proving combinations of feed additives perform as good as in-feed AGPs

The first study examined the effect of replacing

performance compared to the AGP treatment, while showing a numerically reduced *Clostridium* count in the intestine.

In the second study, researchers used the synergistic blend of gut health improving feed additives in combination with free and buffered organic acids via feed to replace in-feed AGP. Researchers evaluated the effect on growth performance, carcass quality and the oxidative status of broilers under a *Clostridium Perfringens* type A challenge, compared to birds receiving an AGP. Again, the study found the use of organic acid blends resulted in similar growth performance compared to birds receiving an AGP. Additionally, an increase in breast meat percentage and lower oxidative stress were shown in birds receiving the organic acid blends.

The business impact of Necrotic Enteritis

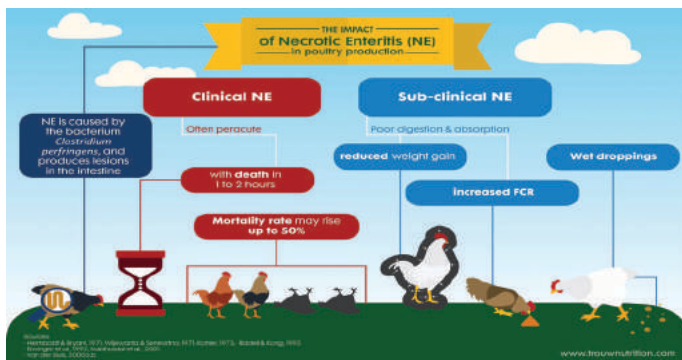
The research findings come at a time when legislative bans on the use of antimicrobial growth promoters are contributing to an increasing prevalence of economically important diseases such as necrotic enteritis. Caused by *Clostridium perfringens*, necrotic enteritis outbreaks have been estimated to cause more than \$2 billion in economic losses annually.

Consequences associated with enteric disease include increased mortality, reduced bird welfare and an increased contamination risk for poultry produced for human consumption.

“Antibiotic-free production systems are becoming an integral part of the poultry production chain as governments respond to the threat of antimicrobial resistance and consumers demand more transparency on food production and safety,” said Dr Emma Teirlynck, Global Poultry Gut Health Manager of Trouw Nutrition. “This research shows that by responding to the challenge with an integrated approach, it is indeed possible to achieve growth performance and health goals even when a disease challenge is present.”

*The second study mentioned in this article refers to TRS Presan-FY and Fysal SP #22

About Trouw Nutrition Trouw Nutrition, a Nutreco company, is a global leader in innovative feed specialties, premixes, feed additives and nutritional services for the animal nutrition industry. It provides products, models and services to boost productivity and support animal health through all life stages. With unique, species-specific solutions, Trouw Nutrition has been meeting the needs of farmers and home-mixers, feed producers, integrators and distributors since 1931. Headquartered in the Netherlands, the company has locations in 28 countries and employs approximately 8,000 people.



NE-animal impact-Infographic for the article

enteritis disease challenge. Denver, Colorado, USA - During the 2nd International Conference on Necrotic Enteritis, 11-12 of July, Trouw Nutrition researcher Yanming Han presented findings of two trials from China and Canada. The trials evaluated the efficacy of combinations of feed additive solutions to support bird health and performance in the presence of a *Clostridium perfringens*

in-feed AGPs with blends of organic acids via feed and water and hydroxy trace minerals via feed. Broilers under a *Clostridium perfringens* type A challenge received a synergistic blend of gut health improving feed additives, a blend of free and buffered organic acids applied in drinking water, and copper hydroxylchloride. Under disease challenge conditions, the feed additive group had similar growth

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Dr Mahesh P.S. makes presentation on Prospects of Indian Poultry Sector At Viv Europe-2018

The VIV Europe happens once in four years at Utrecht, The Netherlands. This time between 20 and 22 June 2018, the tenth edition i.e., 40 years celebration event was organized. VIV-2018 was a very big event with up to 12 halls at Jaarbeurs Exhibition Centre, Utrecht. About 1500 companies across the globe representing Animal Health,

Dr Mahesh P.S., Director of Central Poultry Development Organisation & Training Institute, India was invited by VIV Europe-2018 and Dutch Poultry Federation to address on “Prospectus and Opportunities in Indian Poultry Industry” on day one 20 June between 3.30 to 4.30 pm. Dr Piet Simons, President, Dutch Poultry and Former President,



Dr P.S. Mahesh, Director, CPDOTI, Hessarghatta, Bangalore at VIV Europe

Breeding and Hatching, Feed Ingredients and Additives, Feed Milling Technology, Farm Production, Processing and Handling, Logistics and Media Consultancy were present. During the three days mega exhibition about 20 to 25 thousand people representing various countries of the globe majority being from Europe, Africa and Asia visited VIV. During the VIV, Technical Conferences were chalked out with the theme “Sharing Data = Better Poultry”. Concurrent sessions were held on various topics from day one to day three during 20 to 22 June (For details please visit www.viv2018.nl)

World Poultry Association introduced about India and the prospects for the world. He also introduced the speaker for the audience.

Dr Mahesh presented a comprehensive presentation including an overview of present strength of Indian Poultry Sector with respect to Broiler Farming, Layer Farming, Breeder Farming, Modern Feed Mills, Retail Outlets in India. The audience were made aware about production and performance capabilities of broiler, layer, breeders matching the world standards.

The opportunities for global poultry players



Dr P.S. Mahesh along with Dr Piet Simons and others

were illustrated by gaps in processing sector, automation, modern hatchery systems and data driven farms. The prospects also include in the areas of feed milling technology, use of alternate feed ingredient materials, enzymes etc.

Dr Mahesh briefed the government policy of Government of India focusing on rural backyard poultry and family poultry concept with smaller broiler and layer units. During the presentation, success stories of Madhya Pradesh poultry producers society involved with tribal women, Happy

Hen Farms a premier free range poultry, Mysore Nati Chicken, a total integrated model for coloured chicken in Mysore along with few other success stories on Turkey, Duck and Quail were also presented to the global audience.

The presentation was well discussed and audience appreciated the positive atmosphere of Indian Poultry Sector with growing economy, increased purchasing power, increase in protein demand, India would be a major player in the global arena of poultry sector.

Venkataramana joins Hi-Tech Pharma

Hyderabad: Mr V. Venkataramana, first batch Poultry Science Graduate from Lal Bahadur College, Warangal served A.P. State Meat & Poultry Development Corporation, VSN - Balaji Hatcheries Group, Suguna Foods Group and S R Group for the last 37 years in different capacities. He did his M.B.A. through IGNOU, New Delhi.

Venkataramana joined as



V. Venkataramana, Senior General Manager, Hi-Tech Pharma

Senior General Manager, his earlier colleague Mr N.V. Ramana Reddy, Managing Director, Hi-Tech Pharma Group to assist in expanding Hi-Tech Pharma Group activities

to greater heights. Hi-Tech Pharma manufactures healthcare products for poultry, aquaculture and other veterinary sectors with sales network in different parts of the country.



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Wisium holds seminar

Mumbai: Wisium recently conducted a seminar on unique topic within –Innovation and Firm Services.

Wisium is a premix and specialised additives division of NEOVIA (France). Neovia is a leading service provider with high added value services for animal's health. It guarantees food quality and traceability combined with innovation & reasoned off services. It is presently with its 7 Business activities global.

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Dr Sushanta Saha

The group generates an annual turnover of 1.7 Billion Euros. Company had got 72 production sites operating in 28 countries, with 8800 employees.

Neovia offers a new way to meet the challenges of food & feed safety and reasoned use of services. Its business



M.V. Rao, CEO, SDC Agrovet

strategy is resolutely global, innovative & distinctive. This strategy aims to build a unique & resilient business model, based on multi-activities, multi-spices & multi –geographic approach. This gives a consistent & sustainable growth projected for the company. It 7 business line combined with its presence in 5 geographical areas & expertise's in many animal spices which allows Neovia to provide individualise response to each customer & market .Group has 140 species expert & scientist's to handle customer needs and carry out innovative R&D Project's. This approach is a source of share benefits & real driver for innovation, value creation and differentiation.

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Wisium offers Nutrition

& Beyond through a local approach of production management. It offers feed producers a strong & dedicated partnership focusing in creating value through enhancing performance on quality, productivity & profitability.

Two Seminars were conducted in Southern part of India with partnership of SDC Agrovet India Pvt Ltd.

At Rajmundhry Mr M.V. Rao, CEO, SDC Agrovet India Limited had an introductory speech and explained how



Eric Carfii

these innovations of Wisium help farmers in increasing in productivity.

Mr Ramprasad, Business Development - Sales Director, SDC Agrovet India Limited used his local language skill & innovative way to explain how Wisium Approach could bring value to the customers.



Ramprasad

Wisium India has a unique approach for Indian market with Glocal model.

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CAL –Adaptation to local requirements

This module will surely help the Indian Animal Industry with more productivity, value & results.

From the Executive director for SDC Agrovet India Ltd.

Mr Murthy welcomed the guest & dignitaries on the 16th June 2018 & Shelton Hotel Rajmundhry on 18th June 2018.

From the Business Development Director (Asia)

Mr ERIC Carfii detailed the guest & dignitaries on the plans & future of Wisium India.

From the Regional Business Development Manager

Mr S.P. Ramakrishna introduced Wisium Team to dignitary's.

From the Nutritionist (INDIA)

Dr Niranjana Jadhav Poultry feed Nutritionist explained their implications of Micro Toxins for animal feed production. A demonstration of Accuscan a device used to test different Micro Toxin levels in the feed at Farm. Mycro watch app is also developed by Wisium R & D team. This app helps to provide solutions on the results obtained from Accuscan device with the help of correct dose calibration of Micro TOXIN in activator product of wisium T5X.

Dr Jadhav explained in details on right approach to handle Micro toxin prices to the dignitary's.

From the Business Development Director (India)

Dr Sushanta Saha, Director - Business Development at Neovia, introduced a unique device in "NIRNOW", a device which is ultraportable, which has the capability to test different raw materials & finished feed. This device connected with smart phone & has the potential to scan phone & has the potential to scan and analyse different raw materials used in animal feed. Dr Saha feels that this is going to be a game changer for the farmers & feed millers for Indian Animal production Industry. This device is calibrated to be used in Animal Production Industry by the R & D Team of NEOVIA. He showed live demos on how to use t & its potentiality.



Wisium team with participants of the seminar

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Natural Remedies MD & CEO honoured with “Inspirational Leaders Award 2018”

London: A defining moment for Natural Remedies as its MD & CEO Mr Anurag Agarwal received “inspirational Leaders Award” 2018 at UK-Asia Business Awards & Conclave’ on 17 May 2018, Church House Westminster, London. This award is to celebrate and acknowledge the accomplished generation of innovators, creators and entrepreneurs who have boldly envisioned, realized and substantiated their aspirations to create the future, and transform the world. The recipient of this award is radical & Stellar individuals who epitomize strength, ingenuity,

knowledge, foresight and are driven with vision and inspiration.

Mr Anurag Agarwal has been associated with the company for over 2 decades and has been leading the organization from past 6 years. Under his innovative leadership, the organization has witnessed multifold growth. Natural Remedies has “carved a place for itself as India’s No.1 herbal veterinary healthcare company and made significant in-roads into the world of human healthcare products”.

He is passionately committed to the paradigm of “Harnessing Nature

and Applying Science for Health and Happiness and he firmly believes in “Collaboration and Winning Together.”

He believes, “If your actions inspire others to dream more, learn more, do more and become more, then you are a true leader”.

About Natural Remedies, Natural Remedies is the leading herbal healthcare company in India headquartered at Bangalore. We manufacture & market herbal veterinary & human healthcare products which are scientifically validated, effective, safe and consistent. We are present across various locations in



Anurag Agarwal receiving Inspirational Leadership Award 2018 in London recently

India and rapidly growing in the major markets across the globe. Natural Remedies is recipient of prestigious awards like Asia’s best healthcare brand by Economic Times 2017 & Company with Great Manager 2017 by People’s business & Times group, said a note from the company.

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Alltech Launches Fourth Annual Art Contest for Children

Invites Nationwide Participation

Bangalore: Alltech India, a leading global animal health and nutrition company, announces an art contest for school children. The fourth Alltech India painting competition will accept entries from August 1 to September 30. The winner's painting will be featured in the 2019 Alltech India calendar and will also win cash prizes.

As famed American engineer William Hewlett once said, "Creativity is an area in which younger people have a tremendous advantage, since they have an endearing habit of always questioning past wisdom and authority." "The creative talent of children is truly inspirational," said Dr. Aman Sayed, managing director of India and regional director of south Asia at Alltech Biotechnology. "At Alltech, with our culture of contagious curiosity, we love finding new ways to help you encourage your kids' creativity! We want children to paint their imaginative ideas on canvas and encourage the world to see through their eyes."

Alltech's mission is to improve the health and performance of people, animals and plants through nutrition and scientific innovation. With that in mind, this year's chosen theme is **Water and Life**.

Participants: All school-

age students, between the ages of five and 15, can **participate**.

When: The contest is open from Aug. 1 to September 30, 2018. The last date to send hard copies of paintings to the Alltech office is October 1, 2018.

Rules and guidelines: The artwork should be A3 size (297 mm x 420 mm or 11.7 inches x 16.5 inches) and made on paper (canvas/drawing sheet). Oil paint, acrylic paint, watercolours, poster colours, coloured pencils or pastels may be used.

Submission: The completed art must be scanned and a soft copy sent to alltechartcontest@alltech.com. The hard copy must be sent to the Alltech Bangalore corporate office by post or courier. For more details, write to alltechartcontest@alltech.com.

Contact:

Dr Manish Chaurasia, PR
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E: vmadhuri@alltech.com,
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About Alltech

Founded in 1980 by Irish entrepreneur and scientist Dr Pearse Lyons, Alltech discovers and delivers solutions for the sustainable nutrition of plants, animals and people. With expertise in yeast fermentation, solid

state fermentation and the science of nutrigenomics, Alltech is a leading producer and processor of yeast additives, organic trace minerals, feed ingredients, premix and feed.

Our guiding ACE principle seeks to develop solutions that are safe for the Animal, Consumer and the Environment. Our more than 6,000 talented team

members worldwide put this purpose to work every day for our customers.

Alltech is a family-owned company, which allows us to adapt quickly to emerging customer needs and to stay focused on advanced innovation. Headquartered just outside of Lexington, Kentucky, USA, Alltech has a strong presence in all regions of the world.

What Happens To Your Body If You Eat 3 Eggs Every Day?

Remember that one time when scientists claimed that eating eggs was harmful to your health since they contain cholesterol that can clog your arteries? It seems that eggs, just like avocados, coconut oil, and butter in the past, have fallen victim to false allegations. In reality, eating eggs is not harmful at all (unless you are planning to turn into Rocky Balboa, well then, hello Salmonella infection.)

Medical experts now claim that eating foods containing cholesterol stimulates your liver to reduce its own production. In other words, you are simply replacing your body's natural cholesterol with the type found in eggs. On the bright side, eggs are extremely important for your body. The yolk of an egg is packed with vitamins such as iron and calcium while egg white is an excellent source of protein. Below are six reasons why eggs are a must-have staple in your diet:

1. Eggs are a Great Source of Nutrients

Both the egg yolk and egg white are equally beneficial for you. Egg yolk contains over 90% of the egg's iron and calcium whereas the white of an egg possesses more than half of the egg's protein. A single egg contains all the essential nutrients that your body requires on a daily basis, with the exception of vitamin C. A breakfast consisting of eggs, bread, and a glass of citrus juice is enough to provide you with all the nutrition you need to help your body perform at its optimum level.

2. Eggs can help you Lose Weight

Deemed the 'perfect protein,' eggs rank highly on the satiety index, which means that eating eggs makes you feel fuller than most other foods (1). A study conducted by researchers at the University of Washington discovered that people who eat a 30%



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protein diet ate much lesser calories lesser than people who eat a 15% protein diet. This means that eating high protein foods such as eggs make you feel less hungry, thereby helping you lose weight.

3. Eggs are 'Brain Food'

Eggs are a rich source of the nutrient choline. Choline is an essential nutrient required for improving the brain development in fetuses and newborns. This nutrient helps improve and maintain brain function even at an old age, thus proving to be extremely valuable to the body. It is said that a single egg can provide 28% of a pregnant women's daily requirement of the nutrient choline. Since choline is a crucial nutrient to develop the fetal brain, you must never forget to eat your eggs, especially if you are pregnant!

4. Eggs help keep your Body 'Alive'

Eggs are an excellent source of the mineral iron. Iron is considered to be an essential nutrient because it plays a major role in the production of hemoglobin – a part of red blood cells. Without hemoglobin, your blood cannot transport oxygen from your lungs to the rest of your body. Cells deprived of oxygen cannot perform their functions and end up dying. Therefore, it is extremely important to have a diet that is rich in iron. A single boiled egg contains more than 12% of the daily iron required by a pregnant woman. Not only are eggs a rich source of iron, but the iron found in eggs exists in the form of heme iron – the most absorbable form of iron that exists naturally.

5. Eggs help prevent Cataracts and protect your Eyesight

Medical experts claim that consumption of foods such as eggs, spinach, and broccoli help reduce the risk of developing cataract by up to 20% (2). Eggs are loaded with antioxidants and other essential nutrients. They are a great source of carotenoids such as zeaxanthin and lutein that are essential for your vision. Together, these carotenoids help reduce macular degeneration that is the leading cause of blindness in old age. Carotenoids also protect your eyes from harsh sunlight, help improve your vision in the dark, and reduce the risk of cataracts by approximately 50%.

6. Eggs do not increase the Risk of Coronary Heart Disease

During the 1990s, eggs had become extremely infamous for the levels of cholesterol found in them (a single egg contains 124% of the daily value of cholesterol your body needs). Ever since then, many studies have indicated that there is no correlation between the intake of eggs and coronary heart disease. Furthermore, your heart's health is put at greater risk by trans and saturated fats found in 'junk food' as compared to cholesterol found in eggs.

Not only are eggs extremely beneficial to the human body, but they are also the most cost-effective method of obtaining your daily protein requirements. Now you have no reason to feel guilty for enjoying that devilled eggs breakfast anymore!

by Chandrama Deshmukh
Source: <https://www.stylecraze.com>



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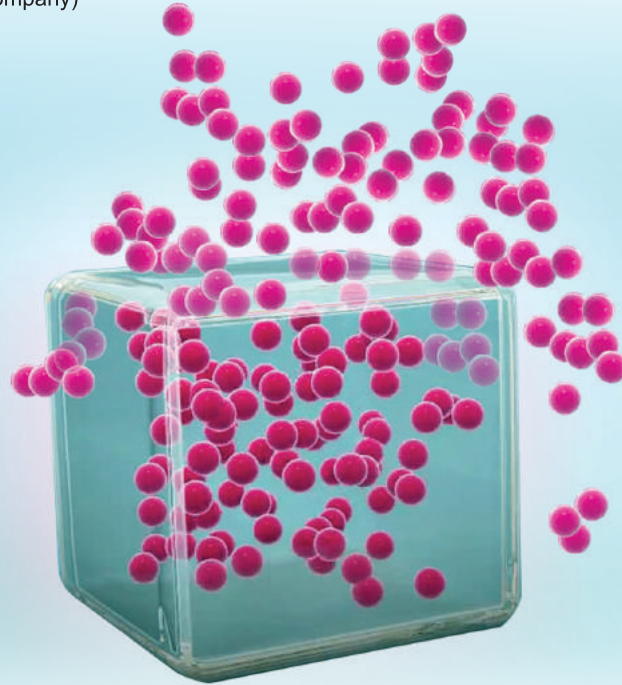
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Poultry business opens new avenues for tribal women in Madhya Pradesh

Kolkata: The 15-km journey from the energy hub of Singrauli to Bachnar, in Madhya Pradesh, opens up a beautiful panorama of forests, meadows, and hills. Till 2014, when she had set up a poultry farm in the backyard, Panmati used to take this road to Singrauli in search of a livelihood.

Panmati is a Gond, a forest tribe that once ruled Central India. Typical of the community average, she has six children, most of whom are school dropouts. Like all Gond families, they too grow maize during the rainy season, but do not have land records.

With Gond men devoted to their cultural tradition of drinking, women hop on to Mahindra pick-ups, the local conveyance, to work as daily labourers. Panmati and 25 other Gond women from Bachnar are now spared this, as they are making Rs 3,000-3,500 a month by raising chicken in the backyard.

Self sustaining

They are now part of a social revolution, spearheaded by Madhya Pradesh Women Poultry Producers Company (MPWPCPL) and its apex body National Small Holder Poultry Development Trust (NSPDT) for tribal and Dalit women living below poverty line.

They have the financial support from the State or donor agencies, offering seed capital to set up a 500-sq ft farm in the backyard

and meet working capital expenses. The farm grows 500 chicks for 23 days. MPWPCPL offers end-to-end support — right from supply of inputs, training, veterinary aid to procurement. MPWPCPL shares part of the profit with members as dividend and the rest is kept as reserve.

“The initiative is self-sustaining. We don’t have to come back here again,” said PK Sinha, Chairman of the Singrauli-based Northern Coalfields. The State-owned miner spent Rs 2.5 crore in sponsoring seed capital to 200 tribal women, and is planning to expand coverage to 300 more women.

Changing lives

Singrauli is a new chapter in NSPDT’s books. The initiative has already changed the lives of 12,600 Dalit and tribal women, including 6000 in 11 districts of MP, 4,800 in nine districts of Jharkhand, 1,000 in Assam, 500 in Maharashtra and 300 in Odisha. Many of them expanded the farm size and earnings, says Harekrishna Deka, CEO, NSPDT.

The introductory effort was taken by the Delhi-headquartered non-profit Professional Assistance for Development Action (Pradan) at Kesla in MP in 1993. Today, the initiative meets roughly 30 per cent of the chicken demand in MP and 12 per cent of Jharkhand.

Eyeing the future

From the initial model of selling live chicken in the local market, State bodies in M.P and Jharkhand have already opened branded outlets — Sukhtawa in M.P and Swayam in Jharkhand — in select cities. The plan is to spread the outlet network across urban centres and sell processed products to enhance value realisation. A Rs 6/7-crore mid-size processing plant is planned with support from

the Australian government in M.P.

The biggest hurdle in this direction is finance. The front-end initiatives are capital intensive.

With barely Rs 3-crore profit on Rs 400-crore turnover last year, NSPDT cannot expect to make much headway on its own. With the flow of grants and soft loans reducing worldwide, NSPDT is mulling many options including access to PE finance.

Poultry owners vow to continue supply

Recalling that tenders for egg supply would be called in every district until six years ago, the poultry owners urged the government to restore the same.

Namakal: The poultry owners have pledged to continue supplying eggs to the midday nutritious meal scheme. Speaking to media persons after the meeting convened by the Tamil Nadu Egg Poultry Farmers’ Federation (TNEPFF) in Namakkal on August 1, its Vice-President Mr Vangli Subramaniam said, “We will not stop supplying eggs to the midday meal scheme at any cost. We will continue to press our demands without stopping the supply.”

Recalling that tenders for egg supply would be called in every district until six years ago, he urged the government to restore the same. “As the contract awarded to Christy Fried gram Industry ends this month, the government called for tender under the scheme, but soon cancelled it. We will supply eggs to them if the government extended its contract to the

company.”

The company in question has not cleared the poultry owners’ bills to the tune of Rs 31 crore until July 17 due to income tax raid, he said, adding eggs are supplied to it at a cost of Rs 4 each, while it receives Rs 4.34 per egg as per the tender. “Now, the price of eggs is rising and if it crosses the tender price, the company will suffer loss and we cannot supply eggs for the price fixed by it for the whole year.” He said they had decided to meet the chief minister or the minister concerned in this regard.

The federation, he said, would extend support to the indefinite strike called by the lorry owners from July 20 and would not operate egg-laden trucks for two days. If the strike continued for over 2 days, they would urge the lorry owners’ association to exempt their vehicles from participating in the strike.



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“Hy-Line Results are Excellent both at Breeder and Commercial Layer level”

Hy-Line International and Srinivasa are working towards fulfilling the goal of “Doubling Farmer’s Profit” with Hy-Line chicks.

Srinivasa Farms Pvt Ltd has completed its first year of collaboration with Hy-Line International, USA with production and supply of Hy-Line Layer breed in India. On this occasion, Poultry Fortune Editor, M. A. Nazeer had an exclusive interview with Mr Suresh Rayudu Chitturi, Managing Director, Srinivasa Farms Pvt Ltd in Hyderabad. Excerpts:



Suresh Rayudu Chitturi, Managing Director, Srinivasa Farms Pvt Ltd

Poultry Fortune: Congrats Suresh ji on your completing first one year of collaboration with Hy-Line International for supply of Hy-Line Layer breed in India. How is the cooperation between your two companies?

Suresh Rayudu Chitturi: Thank you! Yes, the first

year of collaboration with Hy-Line International is fruitful and results are excellent both at Breeder and Commercial Layer. Both Hy-Line International and Srinivasa are working towards fulfilling the goal of “**Doubling Farmer’s Profit**” with Hy-Line chicks.

Poultry Fortune: Do you have any investment in Hy-Line International Layer project in India? Is it a GGP or GP project in India? What kind of collaboration you have with Hy-Line International?

Suresh Rayudu: The GP/GGP will be a joint venture between Hy-Line International and

About Mr Suresh Rayudu Chitturi

Mr Suresh Rayudu Chitturi holds a Bachelor’s Degree in Computer Science Engineering from R.V. College of Engineering, Bangalore, and a MBA from Goizueta Business School, Emory University, Atlanta, U.S.A. In addition, he constantly sharpens his learning curve by doing short stints in top B- Schools like Indian School of Business (ISB) and Harvard Business School (HBS). He has the distinction of successfully completing ‘The President’s

Programme in Leadership’ from Harvard Business School. He holds strong analytical base and flair for innovative thinking that gives him where withal to pursue new opportunities. Suresh Rayudu is presently Co-Chairman of CII, Southern Regional Startuppreneurs Forum. He is the Vice Chairman of International Egg Commission (IEC) for next 2 years. Also he is the only 2nd Indian to be awarded this.



Srinivasa Farms. Eventually it will import GGP. Srinivasa Farms will be exclusive distributor of Hy-Line for all India.

PF: How was the performance of Hy-Line Layer breed at chick, grower and laying stages?

Suresh Rayudu: The performance at all three stages are excellent (liveability, feed consumption, hen housed egg production). Farmers are saving about Rs 10 per Grower up to 18 Weeks compared to other breeds primarily due to feed savings and due to the bird efficiency. Even mortality during the period is very low, in most cases under 3 %.

Most farmers are saving between 5 to 8 grams of feed per egg with very low mortalities. The 5th egg laid by the bird weight above 50 grams. W-80 has the strongest egg shell profile among White eggs, so we expect farmers to have minimal

“
W-80 has the strongest egg shell profile among White eggs, so we expect farmers to have minimal issues with egg breakage and liveability till 90th week.
 ”

issues with egg breakage and liveability till 90th week.

At the breeder front, we have never seen such amazing results, and you know we have been doing this for over 40 years, almost all flocks are performing above standard.

PF: Hy-Line has got different varieties of

Layer breeds. Which variety Hy-line you are supplying in India? What are its merits and benefits to the farmers?

Suresh Rayudu: We are currently supplying W-80 and Silver Brown varieties. The Hy-Line W-80 is a robust white egg layer for all housing systems and environments. This bird delivers prolific egg numbers (420 Hen Housed Eggs upto 90 Weeks), excellent egg shell strength (W80 is having highest egg shell strength among all White layer varieties in the world), strong performance under challenging environments, calm bird for easy management and Feed Efficient Bird (5 to 8 gms less feed per egg compared to other breeds during laying).

PF: Which are the states and areas you are supplying Hy-Line Layer in the country?

Suresh Rayudu: Currently we are supplying Chicks to Andhra Pradesh, Telangana, Tamilnadu, Maharashtra, Karnataka, Orissa and Chattisgarh. We will shortly start supplying Chicks to North India.

PF: Do you see potentiality for integration in Layer sector (like broiler)? Do you have any plans for layer integration?

Suresh Rayudu: Integration of the kind in broilers is not that common in other parts of the world, that said, I do see some interesting models developing in India. So, I guess there will be some integration in layers too in future.

Srinivasa Farms is not intending to get into commercial layer farming as it stands, as we are not comfortable in competing with our customers. We do have interest in bringing in some new ideas into the business, so in that process we will explore some innovative business models.

“
Integration of the kind in broilers is not that common in other parts of the world, that said, I do see some interesting models developing in India. So, I guess there will be some integration in layers too in future.
 ”

PF: How is the growth and development of layer sector in India?

Suresh Rayudu: Layer segment is growing at about 6 to 7% per year. Layer farmers are going for new technology and environmental controlled Houses for improving production efficiency. The industry is operating at par with world standards in terms of productivity and introducing and adopting new technologies.

PF: How do you see potentiality and future prospects for layer industry in the country?

Suresh Rayudu: Our per Capita Consumption is 70 Eggs compared to 180 Eggs recommended by National Institute of Nutrition. We have huge scope in terms of market size. The Layer Industry will double in next seven years.



Suresh Rayudu with his father and Chairman of Srinivasa Group C. Jagapati Rao when he received 'Best CEO in Indian Poultry Award 2016'

PF: What kind of chicks distribution network you have in the country?

Suresh Rayudu: We are having breeder farms and hatcheries in Andhra Pradesh, Telangana and Tamilnadu. We will have hatcheries in Maharashtra and Haryana shortly to cater to these markets.

PF: What is the area of your operations for Hy-Line chicks supply?

Suresh Rayudu: We are the exclusive distributor of Hy-Line Chicks in India. We will be supplying to Pan India by next year.

PF: How is acceptance and response from farmers for Hy-Line breed?

Suresh Rayudu: I'm very encouraged by the response so far. When we compare to what we anticipated, will be our challenge, our experience so far has been much smaller. So far, farmers in most parts have been focused on egg numbers, without much focus on quality of eggs and production cost, but as Indian consumer is getting more informed and our retail systems are getting more modernised, quality of eggs will get more & more important. As feed prices are increasing it's also time

to focus on efficiency of operations. Both these factors will mean Hy-line will become the choice more and more.

PF: Your Srinivasa Hatcheries has good reputation in coastal districts of Andhra Pradesh. Is there any change from poultry farmers of the area with your change of breed to Hy-Line layer with regard to its acceptance?

Suresh Rayudu: Farmers have great confidence in Srinivasa brand though they had some questions about the breed i.e. how the bird will recover after disease / how will be the response to summer heat. During last one year most of the concerns are addressed in field and farmers are quite happy with the field performance.

PF: What do you suggest farmers about the management in rearing Hy-Line layer and to achieve better yield and performance?

Suresh Rayudu: The critical factor for a long laying cycle bird is body weight achievement during rearing.

Hy-Line bird is easily getting the body weight as per the standard.

PF: What is the size of Hy-Line chicks supply in the country in the first year of your operations with this breed.

Suresh Rayudu: Right now our challenge is ramping up production, which we are doing almost every quarter. We will have achieved more than 20% market share in 2018.

PF: Some people comment that India needs different layer breeds to give choice to the farmers, but it requires pure line project in India to be well successful with consistency. What is your observation and opinion in this aspect?

Suresh Rayudu: For most part this is an outdated model and thinking. There is no point having a Pure-Line operation if it's not really world class, and that is not cheap. Also we have to look at what is the value add of such an operation, purely

“
We are having a turn-over of about Rs 800 crores and expanding rapidly. We are having layer and broiler breeders, Soya Extraction, Poultry feed, Chicken Processing and Chicken Retailing.
”

emotional reasons are not good business model. The production systems are for most part converging, hence environmental issues will be less and less of an issue.



PF: What is the size of Srinivasa Farms Group in value? What are the different activities you have in poultry and other sectors?

Suresh Rayudu: We are having a turn-over of about Rs 800 crores and expanding rapidly. We are having layer and broiler breeders, Soya Extraction, Poultry feed, Chicken Processing and Chicken Retailing.

We will shortly add value added chicken and liquid egg products from the upcoming facility in our Mega Food Park in Prakasam district, Andhra Pradesh.

PF: What are your future plans?

Suresh Rayudu: We envisage of being leading player in Poultry breeding and Processed / Value Added Poultry products.



Enzymes

- Nutrase Xyla
[Bacterial endo 1,4-β xylanase]
- Nutrase P 5000 & 10000
[Bacterial 6-Phytase]
- Nutrase BXP 500
[Multienzyme complex with Phytase]

Specialities

- EndoBan
[Bacterial endotoxin deactivator]
- BroClear
[Essential oil based mucolytic and bronchodilator for respiratory distress]

Toxin Binder

- Free-Tox
[Polyvalent mycotoxin binder & mould inhibitor]

Immuno Modulator

- Y Mos
[Yeast based immunomodulator]

Pigments

- Colonut - Yellow
[Natural Yellow Pigment from Marigold]
- Colonut - Red
[Natural Red Pigment from Red Pepper]

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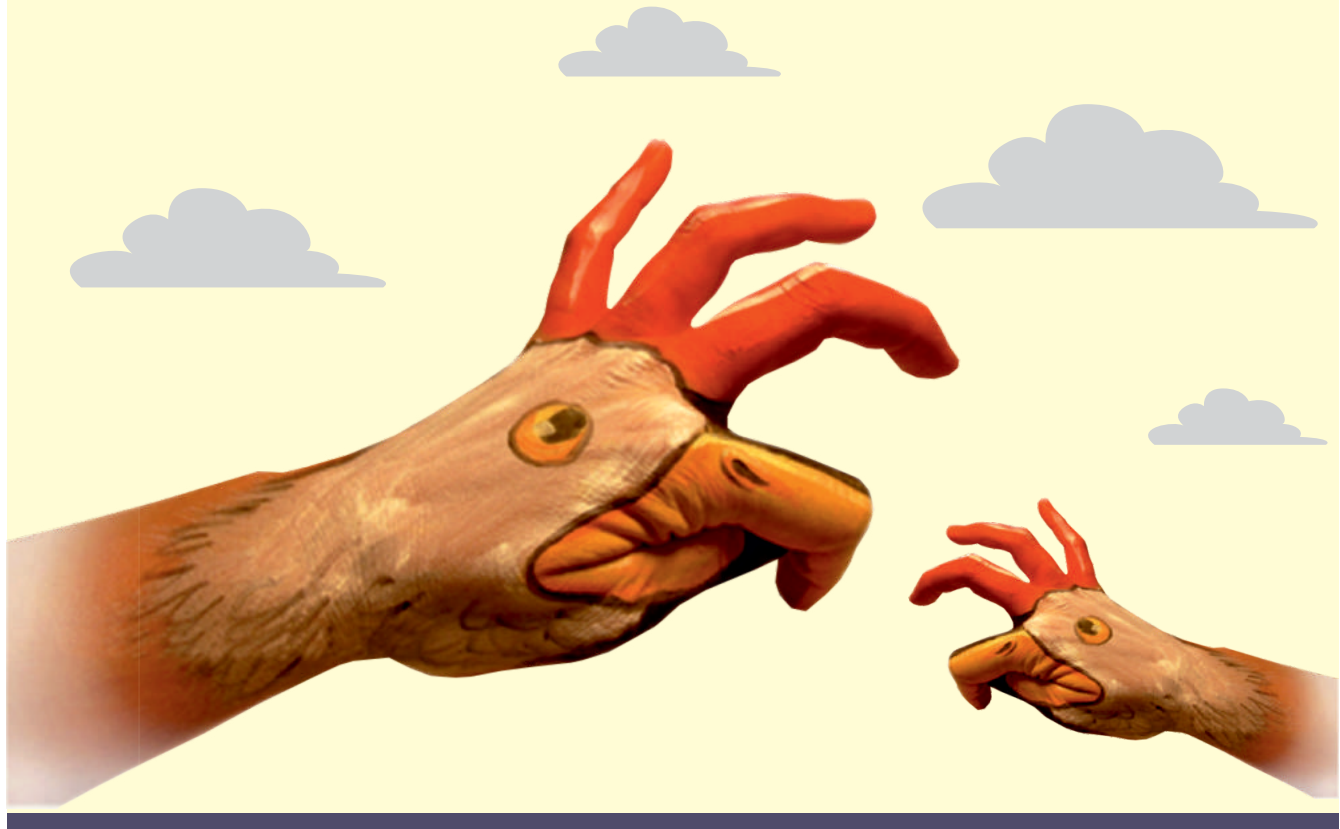
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SKOV ventilation solutions cater to Poultry production for Broilers, Breeders & Layers

“Today SKOV A/S has Dealer & Agent network of more than 75 companies who support our markets locally who understand the local cultures and supports in Sales and Services. And in INDIA our partneris M/s. Viven Innovative Technologies”

Skov Asia Ltd organised a seminar on poultry ventilation mainly focusing on Broiler Breeders, Broilers and Layers in Hyderabad on July 16 and explained about latest technology and the products of the company. Poultry Fortune Editor Mr M. A. Nazeer had an exclusive interview with Mr Soren Lundby, Managing Director of Skov Asia Ltd. Excerpts:



Soren Lundby, MD, Skov Asia Ltd

Poultry Fortune: What was the purpose of Skov meeting held in Hyderabad on July 16 ? How is it useful to poultry farmers and breeders?

Soren Lundby: SKOV seminar was conducted for Ventilation for poultry market in India mainly in focus on Broiler Breeders, Broilers and Layers. In the event, we have presented wide range of topics like, Why Ventilate / Production

“ SKOV ventilation solutions cater to poultry production for Broilers, Breeders & Layers, and Piggery in the global markets delivering what animal needs to grow. ”

monitoring and Management / and our newest product BlueFan and how it is usefull to our customers.

Poultry Fortune: Where is Skov global Head Quarters? Please tell us about the production facilities you have.

Soren Lundby: SKOV A/S factory is located in Glyngoere, Denmark with more than 16,000 sqmt of under roof area used for production of Equipment, Warehouse, R&D



SKOV is a Full Line Company

and customer support with more than 355 employees with global presence, 300 employees in Denmark and 55 employees working out of Denmark.

- ◆ SKOV is a customer centric company which develops products at SKOV R&D - test – produces – shipping – and also provides education through Academy.

PF: What kind of products do you manufacture for poultry – Layer & Broiler segments?

Soren: SKOV ventilation solutions cater to poultry production for Broilers, Breeders and Layers, and Piggery in the global markets delivering what animal needs to grow.



SKOV A/S Factory located at Glyngoere, DK-7870 Roslev, Denmark

◆ Ventilation Solutions like LPV system for Cold Climates / Combi-Tunnel system for Cold to Hot Climates / Tunnel + Systems for Moderate to Hot Climates / Tunnel Cooling System Hot Climates regions around the world.

“ SKOV R&D today is with more than 70 employees involves in developing energy efficient systems with best performance and also improvement of existing systems. Products, Hardware and Software at Denmark Factory. SKOV A/S invest more than 10% of the turnover into R&D annually to deliver the best systems to customers to improve productions. ”

- ◆ Product groups manufactured for Ventilations.
- Controller systems / Alarm / Air Inlets / Winch Motors / Cooling PADs / Gutter / Side Wall & Tunnel Fans such as BlueFan.
- ◆ Product groups manufactured for Farm Management.
- Farm Online Software / Production monitoring with Feed Weigher / Bird Weigher / Water Meter / Egg Counters which gives real time data for Poultry Producers.
- ◆ SKOV A/S has developed New Generation of Tunnel fan – BlueFan with 56” Blade diameter with characteristics of Intelligent Design, Best Energy Efficient, Highest performance, Direct Drive, Longevity and low maintenance fan. BlueFan is tested and certified at world renowned Test Facility ‘BESS LAB’ for its performance.

- Motorized Shutter for Opening / Closing and Air Tightness and minimizes Heat Loss during Cold periods.
- Energy efficiency and best Airflow ratio delivered even at High Pressure Design Cage Houses up to 40% of energy saving.
- Variable Speed control delivers Highest Energy Efficiency with SKOV’s Dynamic MultiStep Control program.
- Fan Motor and Shutter Motor are IP65 rating which gives Water & Dust resistance and can be cleaned with pressurised water





Skov team along with leading poultry industry participants of the seminar held in Hyderabad on July 16.

for best results.

- BlueFan is made of ThermoPlast and Stainless steel non-corrosive materials for longevity and low maintenance .

PF: Do you have R&D facilities? If so, please provide its details.

Soren: SKOV R&D today is with more than 70 employees involves in developing energy efficient systems with best performance and also improvement of existing systems. Products, Hardware and Software at Denmark Factory. SKOV A/S invest more than 10% of the turnover into R&D annually to deliver the best systems to customers to improve productions.

“ There is huge demand for efficient and sustainable food production all over the world in order to meet the demand of the growing world. ”

PF: Which are the countries you are supplying your poultry products?

Soren: SKOV A/S has global presence with more than 70,000 houses delivering results in 80 countries with ambient climatic conditions ranging from -40 Deg C to +50 Dec C.

- SKOV A/S presence is closer to our customer with offices located apart from Denmark in

Thailand / Middle East / China / South & North America.

PF: How is the acceptance and response from the customers for Skov products?

Soren: Customer benefits from using SKOV systems to optimize their production.

PF: What are the advantages and benefits the farmers and breeders have with regard to liveability, feed consumption, production / yield and in other aspects?

Soren: SKOV systems are tailored designed according to local temperature and needs of the farmer.

PF: How do you see potentiality and future prospects for layer and broiler industry globally?

Soren: There is huge demand for efficient and sustainable food production all over the world in order to meet the demand of the growing world.

PF: What kind of distribution network you have globally?

Soren: Today SKOV A/S has dealer and agent network of more than 75 companies who support our markets locally who understand the local cultures and supports in Sales and Services. And in India our partner is M/s Viven Innovative Technologies.

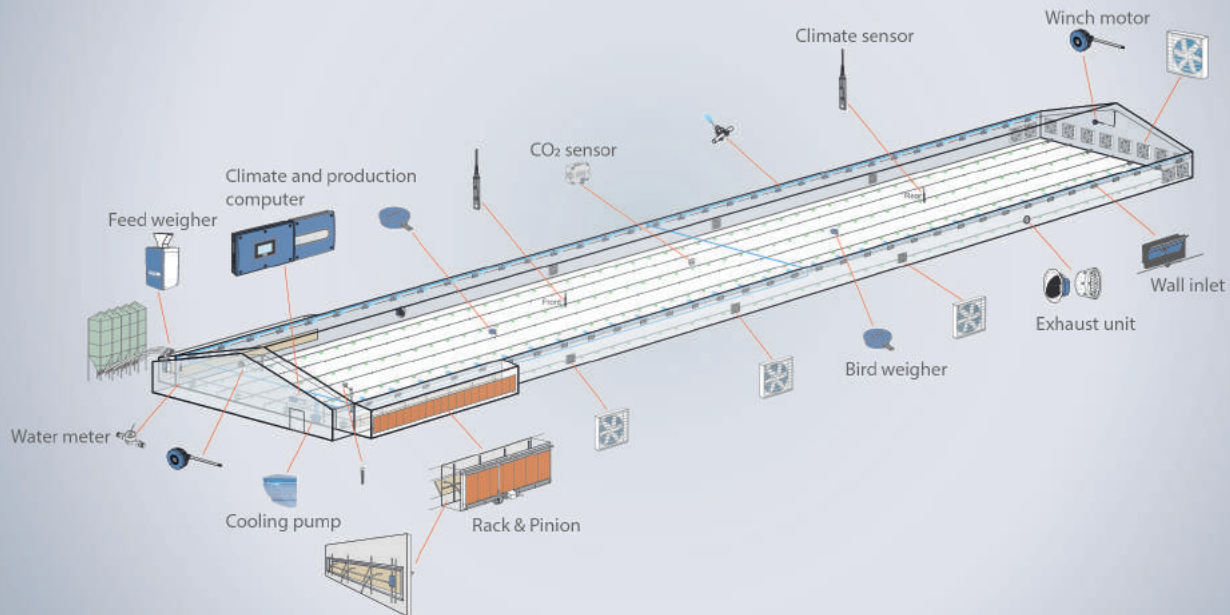
PF: What do you suggest farmers and breeders about the

management with your products to achieve yield and performance.

Soren: Today’s ever changing climatic conditions are putting industry in high risk in terms of productions and performance. SKOV A/S is a PARTNER for design & products and delivering right climate for the birds to grow and to perform better. And with Farm Management systems performance can be monitored online On-The-Go and in real-time data for analysing and corrective action in-time.

- Participants of seminar from SKOV were:
- Mr Soren Lundby,** Managing Director
 - Mr Tommy H Korgh,** Climate & Production Specialist
 - Mr Krishna Prasad K,** Area Sales Manager
 - Mr Satish Kumar J,** Area Sales Manager

“ Today SKOV A/S has dealer and agent network of more than 75 companies who support our markets locally who understand the local cultures and supports in Sales and Services. And in INDIA our partner is M/s Viven Innovative Technologies. ”



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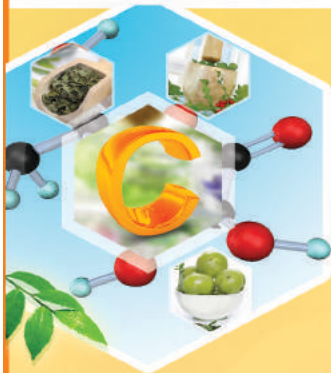
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USAGE

- To protect and overcome the ill effects of heat stress and to prevent heat stress related morbidity & mortality.
- To meet higher physiological requirement of Vitamin C during summer and other stressful conditions.
- To optimise and maintain normal physiological functions alongwith improved FCR, increased weight gain in broilers and optimum egg production and shell quality in layers during heat stress and other stressful conditions.
- To maintain immuno-competence in heat stressed birds.
- To maintain fertility and hatchability in breeder birds.

FEED INCLUSION RATE

100 gm per ton of feed or as advised by the nutritionist.

WATER INCLUSION RATE

(per 1000 birds)
20-40 ml or as advised by poultry consultant.

PRESENTATION

Powder : 1kg, 5 kg & 25 kg pack
Liquid : 1 Ltr. & 5 Ltr. pack



Heat Beat



(Combination of Natural Vitamin C, Organic Chromium Complex & Mint)

Protect your birds from heat stroke with the power of Natural Vitamin C, Organic Chromium Complex & Mint

USAGE:

- To regulate secretion of corticosteroid hormone from adrenal glands during stressful condition and thus limit detrimental stress effects.
- To meet higher physiological requirement of Vitamin C during summer and other stressful conditions in poultry.
- To improve F.C.R. and weight gain in broilers, egg production and shell quality in layers.
- To prevent stress induced depletion of Vitamin C and to overcome the ill effects of heat stress.
- To optimize and maintain immuno-competence.
- To maintain fertility and hatchability at optimum levels in breeders.
- To optimize bioavailability of dietary calcium, iron and other minerals.

FEED INCLUSION RATE

100 - 200 gm per ton of feed.

PRESENTATION

5 kg & 10 kg Pack



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Exchange of Perception, Enigma, Research and Technology



EW Nutrition organized an interactive session for the veterinarians, by the veterinarians -ExPERT at Karnal, Haryana. EW Nutrition believes in sharing knowledge, innovations and technology. ExPERT which stands for exchange of perception, enigma, research and technology; is an idea exchanging platform for the veterinarians. 25 renowned veterinarians from poultry industry joined us for the event. Dr Jayaraman Krishnan, Dr N.K. Mahajan, Dr Shirish Nigam and Dr Kowsigaraj were the key speakers of the event. The event focused on the discussion on Heat and Monsoon stress- the underlying stressors, myths and the new age solutions & realities.



Dr Jayaraman Krishnarajan, Veteran of Poultry Industry with over 25 years of experience, discussed in length about the Summer Stress in poultry: leaky

gut, immuno separation, oxidative stress and respiratory issues. In summer leaky gut is one the major trouble. Impaired gut permeability allows bacterial translocation and transportation of the toxins through tight junctions and causes trouble to the bird. Mucous secretion which happens protects the intestine and reduces the translocations. Summer stress is most dangerous in terms of causing immuno suppression. It not only reduces performance but also causes mortality on account of viral and bacterial challenges on account of immune suppression. Dr Jayaraman showcased via various trail data how phytochemicals are useful in overcoming the summer stress. Phytochemicals reduces the oxidative stress, increases the mucin secretion there by improving the intestinal permeability, reduces respiratory stress and stimulates the intestine for enzyme secretion for better absorption. In the later part of his presentation, he discussed how a good toxin binder is of utmost importance in poultry feed because mycotoxins and fungus

are deceptive in nature. Monsoon poses severe risk problems associated with mycotoxins. Physical detection of toxins will not be always 100 % correct as sometime fungus may not be there but still toxins will be there. More than the single toxin, it is synergies of the various toxins and fungus that effects the bird. Certain toxins even at mild levels damages intestinal permeability. Toxins are immuno suppressive as well which affects the productivity of the birds.



Dr N.K. Mahajan- Dean, College of Dairy Science and Technology, LUVAS, Hisar, showcased how the issue of antimicrobial resistance is affecting not only the poultry industry but the human life as such. At present there is stress on birds because of very high environmental temperature. As a result of stress, viral challenges involving immuno suppressive viruses like IBD and CIA along with Respiratory viruses and bacteria are causing mortality in the birds. Under such scenarios when commonly used antibiotics are not responding as treatment, we need to look towards alternatives that can help cope the problem. There is need of providing immunomodulators / essential oils and secondary plant compounds to manage such situations besides various biosecurity measures.



Dr P. Kowsigaraj, DGM Technical Sales EW Nutrition, shared the Practical experiences of Activo liquid and Grippozone in field. Using various field reports, he showcased the efficacy of Activo Liquid against the resistant bacteria especially E.coli. Activo Liquid is a combination of secondary plant compounds and organic acids which helps fight the intestinal bacterial disease. It improves feed intake and overall performance of bird. Grippozone 285 is mix of secondary plant compounds and essential oils which assists in the management of respiratory challenges in the poultry production system. Grippozone 285 contains 28.5% of the activated compound which is highest in industry.



Dr Shirish Nigam, MD, EW Nutrition South Asia, presented how the business environment is changing rapidly. The knowledge & innovation centres are shifting from labs to fields. He reiterated the dedication of EWN as partner in Progress. EW Nutrition commits to work closely with the customers in bringing new technology and innovations to the

market by investing capital, time, and strengthening processes which will increase the productivity and therefore increases the profitability of the customer. As the Poultry Industry is moving up the value chain, EW Nutrition commits to walk with customers backed by science and technology.



About EW Nutrition:

EW Nutrition GmbH is a dynamic company, globally active with a strong science based product portfolio in the field of functional, innovative feed & food additives. The current product portfolio includes Natural Egg Immunoglobulins (Globigen®), Toxin Solutions (Mastersorb®), Microencapsulated Secondary Plant Compounds

(Active), MOS (Bgmos®), Slow Release Source of Nitrogen (Prote-N®), Complementary Feed Supplements (Stimuvital®), Sanitary and Care Products (Agrochemica®, Humavee).



EW Nutrition is located in Germany (headquarter and subsidiaries Agrochemica and Humavet) but is present in different locations with EW Nutrition USA (Des Moines), GRASP (Curitiba, Brazil), EW Nutrition Japan (Gifu), EW Nutrition China (Beijing), EW Nutrition South East Asia / Pacific (Singapore), EW Nutrition Turkey (Istanbul), EW Nutrition South Africa (Johannesburg), EW Nutrition Australia (Griffith NSW), EW Nutrition Poland (Puszczykowo), EW Nutrition South Asia (Delhi NCR) and EW Nutrition Vietnam (Ho Chi Minh City). For more information, visit: www.ew-nutrition.com

Trouw Nutrition India to Build a New Factory at Jadcherla, TS

Hyderabad: Trouw Nutrition India, a Nutreco Company, is the global leader in innovative feed specialties, premixes and nutritional services for the animal nutrition and aqua industry. On 12 June, 2018, they performed the Ground Breaking Ceremony at Jadcherla (Approx.70 kms. from Hyderabad), Telangana as part of their plans to build a new factory by early 2019. With the mission “Feeding the Future” forming its essence, Trouw focuses on research and innovation for sustainable development. Their ambition is to contribute to meeting the rising food needs of a growing world population in a sustainable manner. Trouw has always believed in “customer-first” approach and in order to service the customers better the new factory is being established at Jadcherla.

Dr Saurabh Shekhar,

Managing Director, Trouw Nutrition India says about the developments that, “India is a key priority market and focus for both Nutreco and Trouw. Opening a factory at Jadcherlais part of these expansion plans. Further, as a commitment to the mission of “Feeding the Future” and to improve access to one of the fastest growing market in Asia, we are investing in a state of the art Greenfield premix and farm mineral production facility.

‘Make in India’ is one of the several steps being undertaken by Trouw Nutrition to serve the esteemed customers in the animal and aqua feed industry in an agile manner to cater their customized needs and demonstrates the commitment of Trouw Nutrition to establish itself as a sustainable solution provider to the industry.

Monthly Average Egg Prices all over India and Prevailing Prices at Various Production Centres (PC) and Consumption Centres (CC) - Source: NECC

For July 2018

Name of the Zones	Month Average Price in Rs
Ahmedabad	410
Ajmer	355
Banglore (CC)	450
Chennai (CC)	485
Chittoor	478
Delhi (CC)	395
East Godavari	410
Hyderabad	390

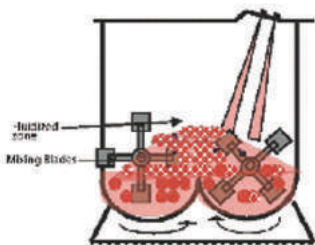
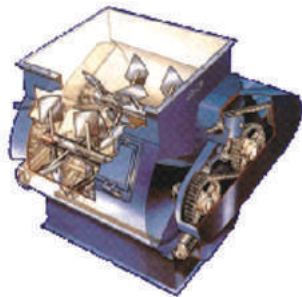
Prevailing Prices

Name of the Zones	Month Average Price in Rs
Mumbai (CC)	470
Mysore	458
Namakkal	470
Pune	475
Vijayawada	410
Vizag	420
West Godavari	410
Warangal	412

Name of the Zones	Month Average Price in Rs
Barwala	350
Bhopal	425
Hospet	415
Indore	390
Jabalpur	415
Kolkata (CC)	455
Raipur	421

Mixer for Bio-Fertilizers / Pesticides

The new generation mixing technology offered by Toshniwal is now available in India for the demanding "bio-fertilizer / pesticide industry". The fluidized zone mixer comprises a series of paddles affixed to two shafts positioned in double-drum housing. The



shaft rotates in opposite direction at a specific peripheral speed. The paddles are angled and overlap in the middle of the mixer. The paddles, mechanically fluidize the material by lifting it and creating a weightless condition in the center of the mixer which creates a very efficient transport system thereby even very large / small amounts of liquids can be distributed evenly throughout the mixture. The special accessory provision of Pin mill system for delumping the powder and liquid addition features proven absolute suitability for the bio-fertilizers and bio-pesticides manufacturing industries which demands large quantity of microbial

(broth) liquid on to the carrier lignite / talc powders to achieve the final product in homogeneous lump free form. This helps to get a consistent and uniform bacterial count level while in storage to get best results for the crop productivity and protection from insecticides.

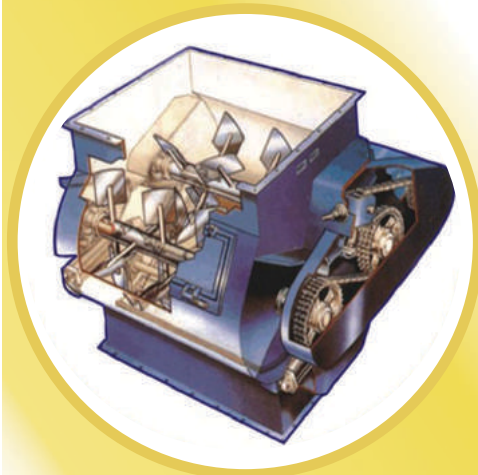
The mixing equipment also has the flexibility with add on features to function as dryer / vacuum drying for agglomerating powders by the addition of binders. Toshniwal Mixer has a proven record for manufacturing seaweed liquid / botanical extracts coated bentonite (granulated) product for plant growth stimulants / nutrition supplements. The Mixer will be provided with liquid dosing system as an option.



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When you are looking for a powder mixer, the ability of mixing is more important than the size of the mixer.

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- * **Short mixing time (typically 30 to 45 sec)**
- * **Gentle & precise mixing**
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- * **Low maintenance cost**
- * **Very low power consumption**

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- * Retrofit ribbon blenders

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Danisco Animal Nutrition

Early IBD Intermediate followed by Plus Vaccination proves effective in Improving overall Broiler productivity in high disease challenge areas of WB: A case study

Dr B. C. Dutta, Poultry Consultant



Introduction

Vaccination is the most practical method of protecting birds against viral diseases. The word Biosecurity is not complete without scientific Vaccination program. No poultry producer would consider a disease prevention programme to be complete without a comprehensive vaccination program, and the Vaccination program would be inefficient without a practical idea of the disease history of the specific area and data thereof.

Vaccination occupies a pivotal position owing to the widespread prevalence of dreaded poultry diseases. Amongst the diseases Infectious Bursal Disease (IBD) is most unnoticed & neglected because of absence of classical clinical outbreak. But suspected early subclinical IBD infections leading to Immunosuppression making the way for entry of other diseases leading to severe losses in poultry. Therefore, a minimum compromise or inefficiency in vaccination program may prove to be detrimental in terms of disease outbreaks and loss of production efficiency.

Therefore, the aim of vaccination is not only to control the specific disease outbreak & minimise mortality but also to prevent immunosuppression to protect the birds from other disease outbreaks leading to high mortality and from all infections & diseases with minimal mortality.

Description and background of the study

The objective of any vaccination program is to produce sufficient antibody in the body of chicken so that the birds can prevent future entry of same infectious organism. Live Vaccines against prevalent diseases is most common vaccination program in broiler considering:

1. History of outbreak of the disease in the given area
2. Age of birds mostly affected
3. Mortality pattern
4. Strain of Virus available in the specific area
5. Vaccine strains available
6. MAB (Maternal Antibody) level of concerned chicks
7. General health of the birds in question.

With Live vaccines the onset of Immunity is very rapid but usually short-lived. The live vaccines may stimulate the production of local or mucosal immunity as well as general immunity. This is the reason why short-lived broilers are being

managed mostly with live vaccines.

The broiler poultry in the district of South 24 Parganas are suffering from various diseases every year during January to May. Mortality during this season is always double digit. There are IBD, IBH, ND, LPAI, CCRD, E Coli, Necrotic Enteritis, etc. No one is honestly trying to identify the actual reason of such huge loss due to high mortality every year. Rather, people want shortcut by using some medicines or disinfectants and are failing repeatedly. Biosecurity practise is very poor with country breed chicken & ducks are roaming everywhere because of socio-economic conditions of the area. In most cases slow mortality starts from 7 – 8

days of age and continue either in same rate or in the form of heavy outbreak. This history speaks about early immunosuppression of chicks and subclinical IBD may one factor.

To understand the effects of IBD virus induced early immunosuppression on Broiler productivity a field study was conducted in the 24 Parganas (South) district of West Bengal, India where human population pressure is very high, the farm density also very high, drinking water quality is poor and highest annual mortality in poultry happens every year due to several suspected viral diseases owing to excessive population pressure carrying out optimum bio-security practices is not always possible.

The study was taken up during a period when the area under study was reeling with heavy mortality due to viral outbreaks. The average mortality across the farms was calculated to be 30% and in some cases mortality as high as 100% was not uncommon. Organ and blood samples from dead & live birds were collected and sent to different laboratories for investigation. However, results were inconclusive because laboratories differ in finding the causative microorganisms and as a result of this no specific Vaccination program could be drawn to help the farmers to get rid of this problem.

Materials and methods

In WB presently, IBD Intermediate Plus strain Live Vaccines are being used as routine at 12 – 14 days. WB is producing only 15% of Broiler Hatching Eggs and rest are outsourcing from other parts of India. The constraint here is that WB broiler producers don't know the breeder vaccination program. In most cases DOC titre of outsourcing eggs has very high CV

and a major percentage of chicks are below protective level. Since last few years WB is suffering from Early Immunosuppression in broiler in the region with slow



Bursa of 8 days age Chicks



Bursa of 9 days Chicks

mortality from 7th or 8th day. Post mortem examination reveals damage of Immune organs. Bursa size varies from very small to double of normal size with pus, sometime haemorrhages. Occasionally, cheesy flakes are noticed. Spleen usually enlarged & congested. Thymus enlarged & congested. Sometime tiny haemorrhagic spots are available in caecal tonsils. There are high incidents of IBH, Hydropericardium, VVND, E coli, Necrotic Enteritis, CRD in the area in almost all farms either in clinical form or subclinical. My experience of working for 10 years in the said area and the current disease scenario was speaking about early immunosuppression. Post mortem examination neither could ignore IBD, nor establish IBD in absence of timely laboratory test. But after seeing the DOC IBD titre (Max 7206, Min 924, Mean 3642 and CV 45.4%) of chicks going to house in that area, I started thinking of doing a field trial with 2 IBD Vaccination.



Bursa & Spleen of 19 days Chicks



Thymus of 19 days age Chicks



Bursa & Spleen of 11 days age Chicks



Bursa of 19 days age Chicks

The effects of 4th Day IBD Intermediate (IBD Suprim of Globion India Pvt Ltd) followed by 14th day IBD Plus Vaccination were tested in farms of Bonobithi Farms Pvt Ltd (Midnapur Hatchery Group), a broiler Integrator, at their Baruipur branch of South 24 Parganas, WB. In total 29 farmers were selected randomly in the area where chicks are being housed from 12 hatches during 21st March to 14th April 2018. Total 19 farms (Treatment) were administered two IBD Vaccination & 10 farms remain as control with only one IBD Plus Vaccination and their farm data of the harvested flock was collected.

The methodology of application of IBD Intermediate & IBD Plus are described below:

1. All birds in the 19 Treatment farms are administered with IBD Suprim (Intermediate Strain) on 4th day and IBD Plus (Intermediate Plus) on 14th day. The birds of 10 control farms are administered with IBD Plus vaccination on 12th day. All vaccines are used through Eye drop route.
2. Other Vaccinations (6th day ND Master Clone & 20th day ND VH) and Medications are same for all 29 farms.

The details of the farm wise performances are presented in Table-1 (on next page)

It may be noted that this is not a formal trial maintaining protocol with same chicks, same feed under similar management practise and in same climate. Here only feed is common and chicks are from same breeding farm & same hatchery but of different hatch date. Husbandry practise & infrastructure are different in all 29 farms but under same climate & disease challenge situation. Every individual farms have its own limitations and farm group performance has been given better weightage rather than any individual farm. That's why to minimize error, average results of Control & Treatment are compared while analysing final results of the study.

Table-2 data suggests that Early IBD Intermediate followed by Intermediate Plus Vaccinations improved the productivity of the broilers. Despite presence of poor drinking water and disease threats, mortality decreased in the treated farm group to a great extent and this resulted in slide improvement in body weight, productivity index and feed conversion ratio at the time of harvest. This may be because early IBD Vaccination prevents the treated birds to get infected early from field IBD virus and thus immunosuppressive effects were lower compares to the birds not received early IBD vaccines, which in turns prevents entry of other infections at later stage of life resulting lower mortality with higher productivity. Immunocompetence of treated group birds seems to be better than those of un-treated birds.

The difference in mortality between the IBD Suprim administered farms and the un-treated farms under similar bio-security situation is fascinating and averaged to be 1.62%. The difference in C FCR (FCR at 2 kg body Wt) between the two groups was 12 points which means a saving of 12 gm of feed per kg broiler.

Table 1: IBD Suprim field trial with at Baruipur, 24 Parganas (s), West Bengal

Farm	Vaccine Schedule	Hatch date	CHICKS	Mort %	Body Wt	F C R	M Age	Day Gain	EEF	CFCR
Farm 1	IBD Plus	21-Mar-18	1,436	15.53	1.923	1.801	38.00	50.60	237	1.820
Farm 2	IBD Plus	21-Mar-18	2,255	11.18	1.959	1.723	40.03	48.94	252	1.733
Farm 3	IBD Plus	21-Mar-18	1,480	12.91	2.018	1.764	41.00	49.23	243	1.760
Farm 4	IBD Plus	23-Mar-18	1,990	11.31	1.907	1.895	41.08	46.43	217	1.918
Farm 5	IBD Suprim + IBD Plus	26-Mar-18	1,390	13.60	1.947	1.797	40.00	48.66	234	1.810
Farm 6	IBD Suprim + IBD Plus	26-Mar-18	1,298	10.55	1.912	1.879	39.30	48.65	232	1.901
Farm 7	IBD Suprim + IBD Plus	26-Mar-18	2,489	10.49	1.837	1.713	40.20	45.70	239	1.754
Farm 8	IBD Suprim + IBD Plus	31-Mar-18	900	14.22	1.592	1.741	38.00	41.90	206	1.843
Farm 9	IBD Suprim + IBD Plus	31-Mar-18	1,970	12.94	1.962	1.807	42.20	46.49	224	1.816
Farm 10	IBD Suprim + IBD Plus	31-Mar-18	948	13.19	2.043	1.733	41.00	49.84	250	1.723
Farm 11	IBD Suprim + IBD Plus	31-Mar-18	1,289	9.08	1.885	1.901	42.13	44.74	214	1.930
Farm 12	IBD Plus	02-Apr-18	1,538	13.78	2.087	1.713	40.01	52.17	263	1.691
Farm 13	IBD Suprim + IBD Plus	02-Apr-18	1,839	21.70	2.005	1.924	42.13	47.59	194	1.923
Farm 14	IBD Suprim + IBD Plus	04-Apr-18	2,355	19.58	2.004	1.952	43.36	46.23	190	1.951
Farm 15	IBD Suprim + IBD Plus	04-Apr-18	2,374	16.64	1.898	1.757	39.18	48.45	230	1.782
Farm 16	IBD Plus	04-Apr-18	895	10.50	1.925	1.757	41.49	46.41	236	1.776
Farm 17	IBD Plus	07-Apr-18	4,156	20.45	1.948	1.857	41.55	46.88	201	1.870
Farm 18	IBD Suprim + IBD Plus	09-Apr-18	2,587	8.08	2.462	1.742	44.33	55.53	293	1.627
Farm 19	IBD Suprim + IBD Plus	09-Apr-18	2,169	6.64	2.076	1.646	40.28	51.53	292	1.628
Farm 20	IBD Plus	11-Apr-18	1,390	7.41	2.192	1.797	42.00	52.20	269	1.749
Farm 21	IBD Suprim + IBD Plus	11-Apr-18	1,192	8.72	2.152	1.871	42.22	50.97	249	1.833
Farm 22	IBD Suprim + IBD Plus	11-Apr-18	1,990	4.92	2.149	1.815	42.32	50.78	266	1.778
Farm 23	IBD Suprim + IBD Plus	11-Apr-18	1,287	10.26	2.304	1.841	45.58	50.55	246	1.765
Farm 24	IBD Suprim + IBD Plus	12-Apr-18	1,383	12.58	1.978	1.832	38.89	50.86	243	1.837
Farm 25	IBD Suprim + IBD Plus	12-Apr-18	1,192	18.12	2.162	1.934	43.76	49.40	209	1.893
Farm 26	IBD Plus	13-Apr-18	1,783	10.94	2.361	1.905	46.87	50.37	236	1.815
Farm 27	IBD Suprim + IBD Plus	13-Apr-18	1,798	11.40	2.188	2.049	45.55	48.03	208	2.002
Farm 28	IBD Plus	13-Apr-18	1,596	9.52	2.419	1.872	47.74	50.67	245	1.768
Farm 29	IBD Suprim + IBD Plus	14-Apr-18	2,790	6.95	2.309	1.699	43.08	53.59	294	1.621

Table 2: Comparative performance of treated vis-a-vis un-treated farms

Treatment	No of Farms	Chicks	Mortality %	Body Wt (Kg)	F C R	Mean Age	Day Gain	EEF	C FCR	Production
+ IBD Suprim	19	33,240	11.86	2.071	1.810	41.92	49.41	241	1.792	69.48
- IBD Suprim	10	18,519	13.48	2.062	1.819	41.99	49.11	233	1.804	70.13

Table 3: Economics of IBD Suprim treatment

Parameters	Treatment	Control
Chicks	33,240	18,519
Weight Sold (Kg)	60,681	33,036
Feed Consumed (Kg)	1,09,840	60,090
Med Cost (Actual)	62,491	34,816
Chick Cost (as per Standard)/Kg Broiler	14.24	14.57
Feed Cost (as per Standard)/Kg Broiler	51.97	52.29
Med Cost/Kg Broiler	1.03	1.05
Broiler Growing Cost/Kg Broiler to Farmer	5.06	4.74
Overhead Cost/Kg Broiler	1.64	1.68
Total Cost of production Rs/kg	73.94	74.33
Net profit Rs/kg	0.39	

The economics of the treatment with IBD Suprim is presented in Table 3 where it has been shown that IBD Suprim treatment yielded Extra profit of Rs 0.39/ per Kg broiler which was possible due to substantial reduction in production cost by achieving a better liveability and better FCR.

It is concluded from the field trial that two IBD Vaccination; 4th day Intermediate followed by 14th day Intermediate Plus, broiler productivity can be substantially improved yielding greater profit to the farmers.

Acknowledgement:

1. Sri Amitava Maity, MD, Midnapur Hatchery Group, Kolkata.
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3. Globion India Pvt Ltd, Hyderabad

Lipid Evaluation Discloses Volatile Energy of Fats and Oils

Chandrasekar S, Rengarajan S, Rahul Mathew and Snehal Tawde

Introduction

Fats and oils are the most concentrated and expensive source of energy for poultry diets. Apart from this they also serve in aspects of feed quality, milling efficiency, palatability, reducing dustiness etc. Being expensive source of energy, it is highly important to assess the quality of fats for ideal procurement and appropriate ration formulation.

Assessment of fats and oils could be done through two primary aspects like oxidative quality and nutritional quality apart from the physical evaluation.

Oxidative Quality

Measuring the oxidative quality of fats and oils through Peroxide Value (PV) is a most common phenomenon. However, sometimes PV can mislead with low values when oxidation is nearing the end. Under such circumstances, Anisidine Value (AV) and / or Totox value (TV) could help to understand the oxidation process in a better way.

The other useful tools for understanding oxidation status are

acid value (free fatty acids - FFA), thiobarbituric acid (TBA) and iodine value (IV).

Nutritional Quality

To animal feed applications, it is of high importance to assess the nutritional quality of fats. Beyond oxidation, the components like U:S ratio and NEM will have greater impact on the nutritional value.

Factors on Nutritional Quality

- ◆ Free Fatty Acids
- ◆ U : S (Unsaturated and Saturated Fatty Acids) Ratio
- ◆ NEM (Non Elutable Matter)
 - MIU (Moisture, Impurities and Unsaponifiables)
 - Oxidised and Polymerised Fats
 - Glycerol

Predicting the energy values is of high importance for superior economic realization and appropriate ration formulation.

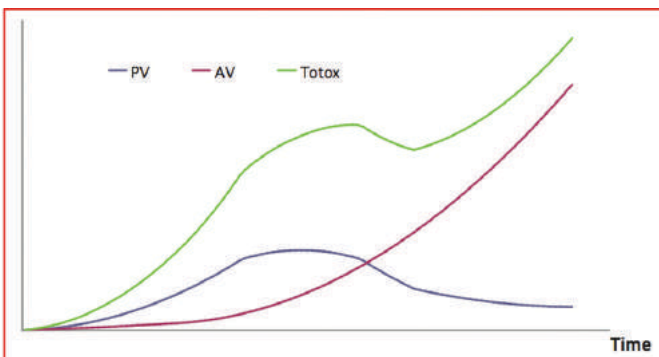
Wiseman Equation

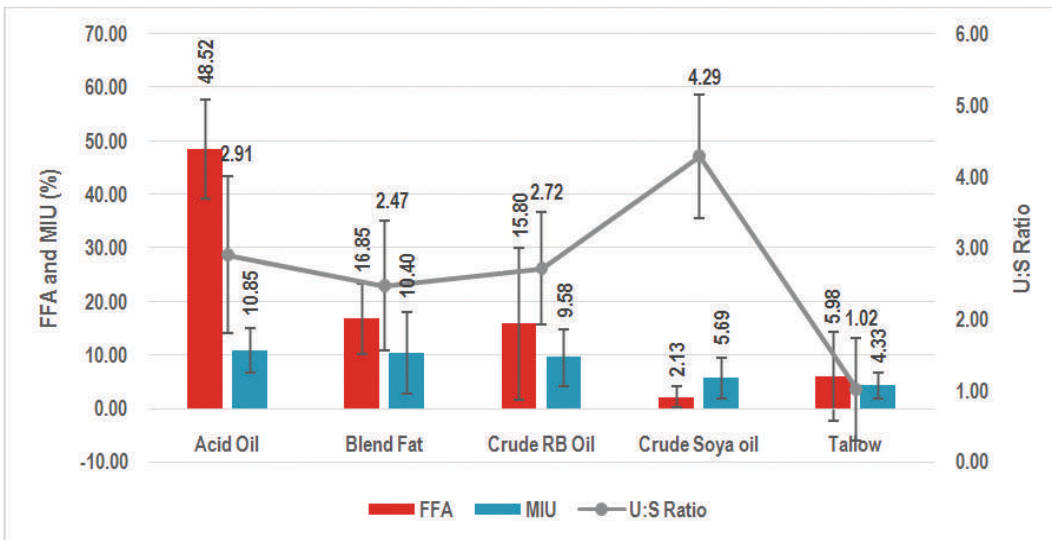
$$E = \left[A + B \cdot \text{FFA} + C \cdot e^{D \left(\frac{U}{S} \right)} \right] \cdot \left(1 - \frac{\text{MIU}}{100} \right)$$

The study by Wiseman J, established the relationship between the degree of saturation, the level of free fatty acids and MIU on the energy value of the lipids in correlation with bird age.

Lipid Evaluation Test (LET)

LET assesses the fatty acid profile, oxidative quality, free fatty acids and MIU which are the critical information required to assess the metabolizable energy value of lipids.





feed for young birds and 2.0-2.25 for older birds could be ideal.

AME of Fats and Oils

Average energy values of different fats have been calculated in which the variation among the samples ranged from 15-26%, whereas the difference between the best and lowest values had above 35% variation.

Variation in Crude RB Oil

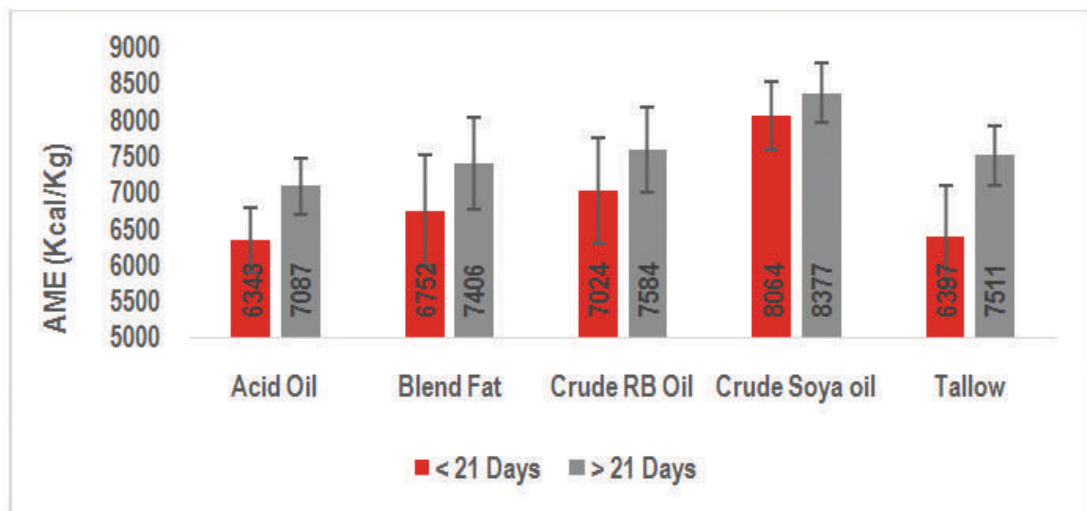
Being a commonly used source, the ME values of crude rice bran oil is

Findings of LET

Kemin assessed close to 250 samples of fats and oils commonly used in poultry diets and following are the representation on FFA, MIU and U:S ratio of them.

The free fatty acids levels of commonly used oils like crude rice bran oil and blended vegetable oils were relatively higher than the assumed levels for purchasing criteria. MIU really needs attention from the point of purchasing to ration formulation and this directly reduces the energy in relation to their level of the lipid. Lesser the U:S ratio makes the digestibility challenging for the bird, especially emulsification and hydrolysis and so delivers relatively lesser energy, However, a final U/S ratio of 2.25-2.50 in the complete

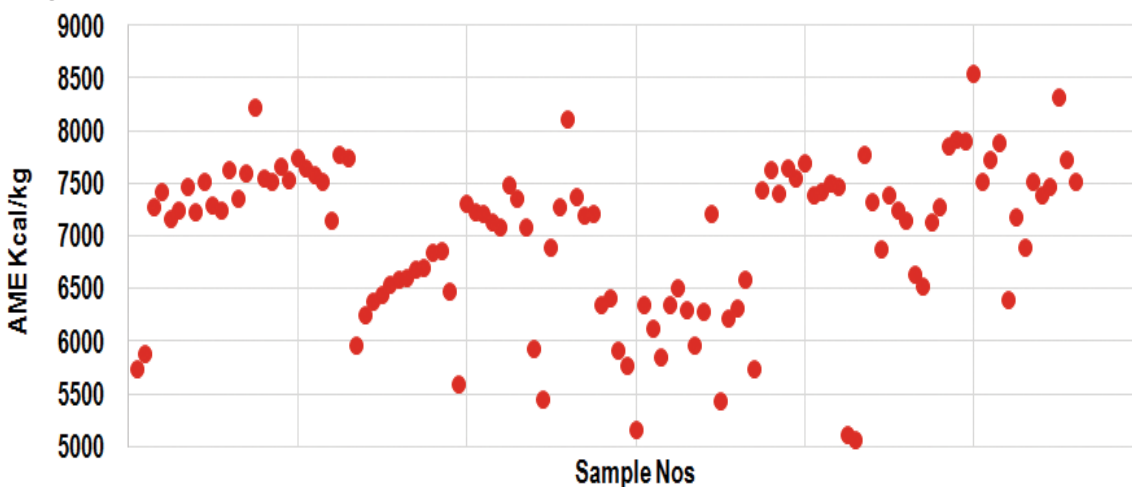
depicted here. It demonstrates the variation in energy and demands a strict quality procedure for predicting ideal values for ration formulation.



The data shows the clear variation among different types of oil which is obvious. Whereas the variation within the same type of oil is a concern for the feed formulator on applying

a specific reference energy value for ration formulation.

It could be ideal to use age specific ME values for feed formulation or use of superior nutritional emulsifier which can narrow the energy gap arise in the final ration.



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Minerals, Vitamins and Their Interactions in Poultry

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Introduction

Nutrient interrelationships are complex, especially among the trace elements. A mineral cannot be affected without affecting at least two other minerals, each of which will then affect two others, etc. As a result there is loss of homeostatic equilibrium causing an adverse effect upon health. A loss of this vital balance, particularly between the trace elements, can lead to subclinical deficiencies. Among the minerals two relationships exist, antagonistic and synergistic, which occur at two levels, metabolic and absorptive.

Antagonism - at the absorptive level is due to inhibited absorption i.e. excess intake of a single element can decrease the intestinal absorption of another element. Ex- high intake of calcium depresses intestinal zinc absorption, while an excess intake of zinc can depress copper absorption

Synergism - occurs largely on a metabolic level.

1. Iron and copper are synergistic in that sufficient copper is required for iron utilization.
2. Synergism between calcium, magnesium and phosphorus is well known due to their requirement in the maintenance and structure of osseous tissue.
3. Deficient intake of an element can allow toxic accumulation another element.
 - Small amounts of cadmium intake can accumulate to a point of toxicity in the presence of marginal or deficient zinc intake.
 - Lead toxicity can occur with insufficient calcium or iron intake.
 - Iron toxicity can develop in the presence of a copper

Highlight Points

- The nutritional importance that may be attributed to these interrelationships depends on the levels considered to be physiological for each nutrient, and on their maintenance at acceptable levels in tissues for the defense of the organism.
- This interaction occurs in different ways, i.e. starting from the action of vitamins on mineral metabolism, from the action of both types of nutrients in the protection of the organism, and from the action of minerals on vitamin metabolism.
- The most significant example of vitamin action on mineral metabolism is the role played by vitamin D in calcium and phosphorus metabolism. The interrelationship of vitamin C and some minerals is also discussed, with emphasis on its relationship with iron.
- With respect to the synergistic action of vitamins and minerals in the defense of the organism, we comment on the main data reported on the biochemical-physiological role of vitamin E and its interaction with selenium.

deficiency.

4. An excessive intake of a single element produces a deficiency of a synergistic element.

Eg: excessive zinc intake contributing to a copper deficiency. Such an imbalance can cause excessive iron to build up in storage tissues.

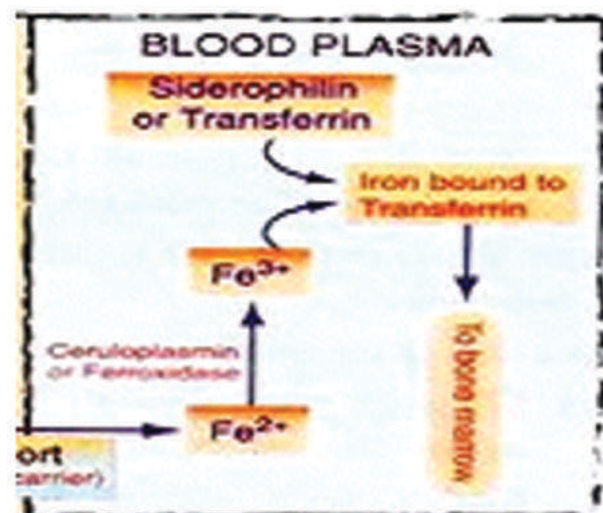
Manganese by interfering with magnesium can result in excessive potassium and sodium.

Mineral – Mineral Interactions

1. Copper with iron.
2. Calcium with phosphorus.
3. Copper with molybdenum & sulphur.
4. Calcium phosphorus with manganese.
5. Zinc with copper & calcium.
6. Calcium phosphorus with magnesium.

7. Iron & cobalt.

Copper with iron



copper essential for conversion ferrous form of iron to ferric form & also for absorption, mobilisation of iron.

Iron decreases copper absorption in 2 ways

1. it binds with Cu in insoluble form
2. Binds with sulphides & forms ferric sulphide which traps the Cu by forming complex

Calcium & Phosphorus

The roles of calcium and phosphorus together in the formation of bone hydroxyapatite. However, optimum broiler performance is linked very closely with calcium and phosphorus levels in the diet. Broilers require fairly narrow calcium to phosphorus ratio usually no wider than 2:1. It has been reported that excess Ca can cause the formation of insoluble Ca-phosphate salts, resulting in decreased P availability. The roles of calcium and phosphorus together in the many reactions and their interaction is depends on cholecalciferol level.

Copper, Molybdenum, Sulphur

Sulphur combines with molybdenum & forms thiomolybdenate & effects copper absorption. Sulphur may be organic or inorganic in renal tubules it converts to sulphites. They interact with molybdenum. This complex interacts with copper forms insoluble Cu thiomolybdate complex.

Calcium, Phosphorus with Manganese

- Excess Ca & P ratio decreases manganese absorption where as alone high Ca has no effect
- Manganese contain enzyme glycosyl transferase required for the formation of muco polysaccharides. Which forms the organic matrix of the bone?
- Increasing dietary calcium and/or phosphorus decreased iron absorption in chicks (Sell, 1965). Excessive dietary manganese decreased hemoglobin in young chicks (Baker and Halpin, 1991).

Zinc with Copper

- Copper increases mucosal induction of metal binding protein thus limits Zn absorption.
- High dietary zinc induced signs of copper deficiency (Smith and Larson, 1946; vanReen, 1953) Effects were reversed by supplementation with copper. High dietary conc of zinc will induce synthesis of metallothionein protein in the intestinal cells to protect animal against zinc toxicosis. Copper has a higher affinity for the protein than zinc which causes a secondary copper deficiency.
- Some other interactions can also occur as the result of simultaneous participation of elements at the active center of enzymes, such as iron & molybdenum in xanthine oxidase or copper and iron in cytochrome oxidase.

Sodium and Chloride

Supplementation of Na (without Cl⁻) in feed leads to an increase in concentration of HCO₃⁻ ions and elevated blood pH, whereas supplementation of Cl⁻ (without Na) decreases concentration of HCO₃⁻ ions and pH value.

Endogenous acid production affects the electrolyte balance. Anion imbalance can be solved by bicarbonate

supplementation in the diet.. The use of some divalent ions can interfere with electrolyte balance.

Thus, supplementation of calcium chloride (CaCl₂) in the diet can induce acidosis in poultry, contrary to chloride sources such as NaCl and KCl, which are associated with acidosis to a much lesser extent.

This is due to the fact that calcium absorption from CaCl₂. sodium, potassium. is lower than that of sodium from NaCl. Calcium bounds to carbonates from CaCO₃ using up bicarbonates from blood, and excessive unabsorbed chlorine causes acidosis.

- Iron and cobalt mutually inhibit the absorption of each other, apparently due to a shared intestinal carrier system (Thomson et al., 1971).
- Excess Ca P Mn Zn Cu decreases Fe.
- High Ca & P causes salt formation & decrease Mg absorption.

Mineral – Vitamin Interrelationship

1. Calcium, phosphorus & vitamin – D.
2. Zinc & vitamin A.
3. Selenium & vitamin E.
4. Cobalt & vitamin B12.
5. Iron & vitamin B6.
6. Calcium ,manganese & vitamin K.
7. Vitamin C with minerals.
8. Sulphur with other vitamins.

Calcium, Phosphorus with Vitamin D

Ca & P homeostasis controlled by active form of vit d 1-25D₃ by some mechanisms

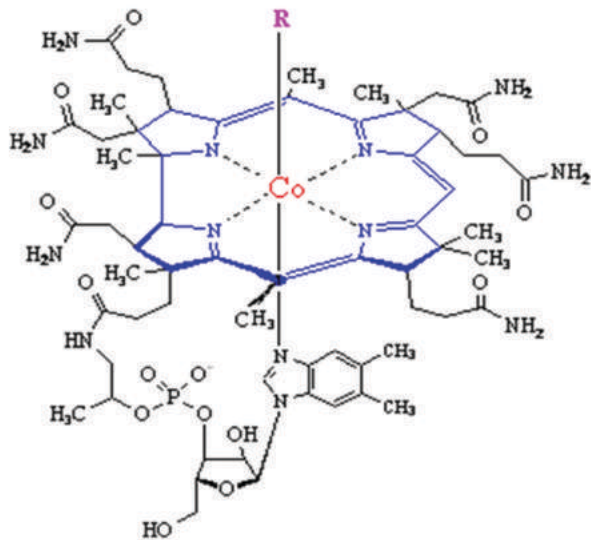
1. It intensifies the diffusion of calcium across the intestinal wall by counteracting the factor which reduces the conc of calcium.
2. By increasing the permeability.
3. Helps in Ca resorption from bone to ECF.
4. Helps in renal absorption of Ca from DCT.

Whenever decreased calcium levels in plasma, stimulates parathyroid gland, stimulates the synthesis of 1-25 vitD₃, synthesis of calcium binding protein & intensifies diffusion of calcium.

Selenium & Vitamin E

- Prevents formation of peroxides, Exudative diathesis in chicks checked by both Se & vitE.
- Glutathione peroxidase is an important enzyme in destroying H₂O₂ and organic hydroperoxides such as lipid hydroperoxides. It therefore guards against oxidative damage to the cell membranes and other oxidant-sensitive sites in the cell.
- While this selenium-dependent system destroys lipid hydroperoxides and other peroxides, vitamin E is believed to protect against oxidant damage to membranes by preventing the formation of lipid hydroperoxides.

Cobalt & Vit B12



The cobalt can link to: a methyl group - as in methylcobalamin a 5'-deoxyadenosine at the the 5' position - as in adenosylcobalamin (coenzyme B12)

a cyanide group - as in Vitamin B12 The core of the molecule is a corrin ring with various attached sidegroups.

The ring consists of 4 pyrrole subunits, joined on opposite sides by a C-CH₃ methylene link, on one side by a C-H methylene link, and with the two of the pyrroles joined directly. The nitrogen of each pyrrole is coordinated to the central cobalt atom.

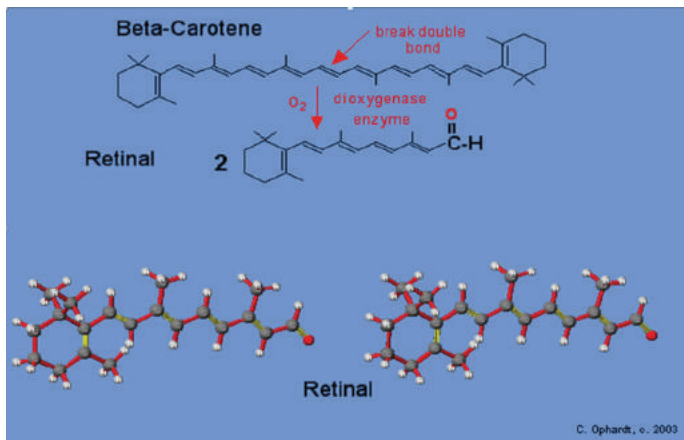
Zinc & vit A

- Plays an imp role in utilisation of vita.
- Responsible for mobilisation of vitA from liver.
- Conversion of b-carotene to vitA & retinol to retinal occurs in presence of alcohol dehydrngense which is a zn metallo enzyme.
- Some def diseases such as parakeratosis , night blindness occurs in presence of both zn & vitA.
- Some experiments showed that depressed plasma vitA def in zn def diet.

Structure of Vitamin A

The two molecules, it is clear that vitamin A (retinol) is very closely related to half of the beta-carotene molecule.

One way in which beta-carotene can be converted to vitamin A is to break it apart at the center and is thought to be most

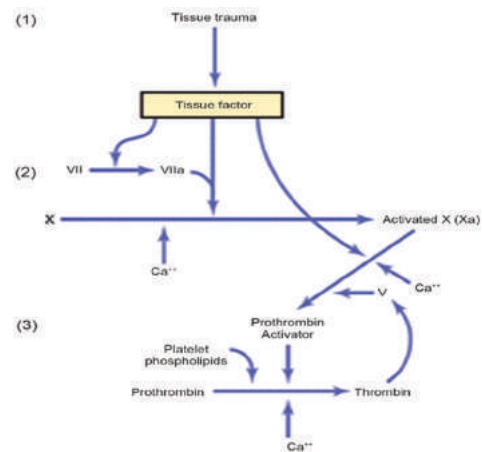


important biologically.

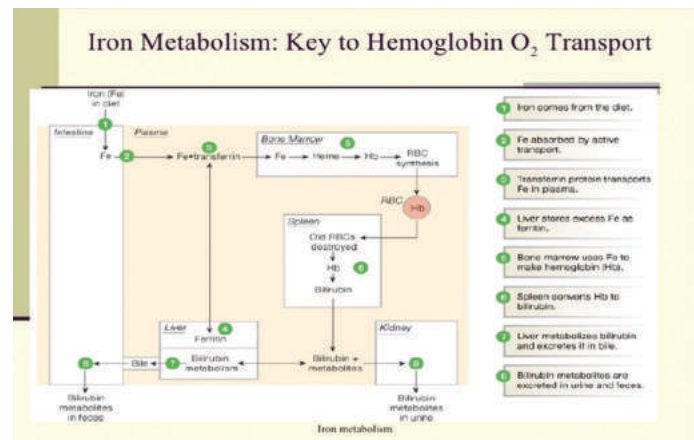
The breakdown of beta-carotene occurs in the walls of the small intestine (intestinal mucosa) and is catalyzed by the enzyme beta-carotene dioxygenase to form retinal.

Calcium, Manganese & Vit-k

- Vit K responsible for synthesis of prothrombin.
- Conversion of prothrombin to thrombin occurs by a manganese containing enzyme glycosyl transferase.
- Ca stimulate the release of thromboplastin from platelets.
- Vit K inadequacy leads to prothrombin deficient in carboxy glutamic acid which is responsible for calcium binding which affects clotting process.



Iron & Vit B6



- Vit B6 helps in incorporation of iron in haemoglobin .
- Diet rich in iron but def in B6 shows the signs of anemia along with signs of B6.

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- High vitamin C in take cause copper deficiency as a result of decreasing its absorption but copper is required in sufficient amounts for the metabolic utilization of iron, excess intake of vitamin C can lead to iron toxicity.
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A comprehensive Survey of Mycotoxin Prevalence in India (2017-18)

Nidhi Madnawat, Shiv kumar, Rajesh K Kharvi and Manish Kumar Singh

Provimi Animal Nutrition India, Pvt Ltd

Abstract:

Provimi India conducted a comprehensive mycotoxin survey for predominant poultry feed ingredients. In total 540 samples were collected from May'17 to February'18 and analysed for 4 major mycotoxins i.e. aflatoxin, ochratoxin, fumonisin & T2. This study revealed that 95% samples were contaminated with one or more mycotoxins. Numerically 513 samples were contaminated with one or more mycotoxins out of total 540 samples analysed.

The lab test inference for this survey was drafted using guidelines of 2006/576/EC, EFSA and US FDA for citing maximum tolerance limit of different mycotoxins in Poultry. Below LOD (Limit of Detection) were considered as normal samples, even though these also can exert negative impact on performance due to additive and synergistic effect occurring between multiple mycotoxins. The study concluded that aflatoxin and T2 remained a major source of contamination followed by ochratoxin and fumonisin. Among all feed ingredients Corn Gluten Meal and DDGS samples were found to be highly contaminated with aflatoxin & T2 mycotoxin.

Introduction:

Mycotoxins are secondary metabolites of low molecular weight produced by a wide range of fungi, principally molds. There are over 200 species of molds that produce mycotoxins. Aflatoxins (AF), zearalenone (ZEN), ochratoxin A (OTA), fumonisin (FUM), trichothecenes such as deoxynivalenol (DON) & T-2 toxin are some of the mycotoxins that can significantly impact the health and productivity of poultry species. These toxins are found as natural contaminants in many feed ingredients of plant origin like cereals, seeds, fodder etc; hence mycotoxins seem to be the most relevant with respect to feed contamination and have a significant economic impact on the livestock industry.

Many published scientific studies and surveys regarding mycotoxin contamination for India are usually limited to single ingredient, very small time period or have small sample size for study. In order to have a better understanding mycotoxin prevalence in animal feed ingredients in India, the present study was done for 10 months in which a total of around 540 raw ingredients samples across India were collected and analysed for Aflatoxin (AFLA), Fumonisin (FUM), Ochratoxin (OTA) and T-2 Trichothecene (T2).

In India, the commonly used ingredients for feed formulation in poultry diets are Corn, Corn Gluten Meal, Soya Bean Meal, Rice Polish, Mustard De Oiled Cake (Mustard DOC) and Dried Distillers Grains (DDGS); hence these were considered for the present study.

The present study was carried out with the following objectives:

1. To determine the prevalence of mycotoxins in major poultry feed ingredients in terms of contamination and their proportion above tolerance limit.
2. To understand the presence of multiple mycotoxin contamination in feed ingredients (AF, ZEN, OTA, FUM, T2).
3. Region wise spread of mycotoxin prevalence for each ingredient.

Material & Method:

Analytical samples

A total of 540 samples, including 126 corn samples, 69 corn Gluten Meal, 57 DDGS, 72 Mustard DOC, 70 Rice Polish, 95 SBM and 51 other samples like fish meal, MBM, groundnut cake, De oiled Rice bran (DORB) were sourced directly from animal farms and feed production sites from different regions. The origin of these samples was diverse, covering all the regions across India.

Ideal sampling methods were adopted during the sample collection. All the samples that were received for the study were grounded and homogenized. A subsample was then taken for the subsequent analytical process.

A choice was made to screen the mycotoxins which included Aflatoxin, Fumonisin, Ochratoxin and T2, or analyse to only Aflatoxin in selected samples.

Mycotoxin analysis

ELISA analysis were performed with a commercially available test kits (Vertex® brand of diagnostics from Neogen®). These kits are often viewed as the gold standard by the food industry for mycotoxin testing approved by GIPSA and AOAC. By running multiple controls and establishing a standard curve through a reader, samples can be plotted against the curve to determine the concentration of analyte present.

The above analysis was performed in Provimi Solutions Lab at Provimi Innovation Centre, Bangalore, Karnataka, India.

Result & Discussion:

The overview of the survey results are as follows.

1. Prevalence of major mycotoxins

Mycotoxin survey was conducted for the different feed ingredients collected from all over India. The followed guidelines of 2006/576/EC, EFSA and US FDA were followed for citing maximum tolerance limit of various mycotoxins in Poultry.



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Name of Mycotoxin	Limit of Detection LOD (ppb)	Maximum Tolerance Limit (ppb)
Aflatoxin	2	20
Ochratoxin	1	40
T2	10	200
Fumonisin	200	1000

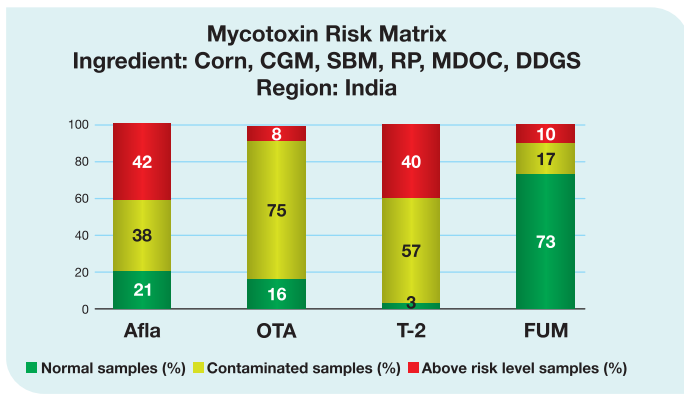
Three levels of contamination have been defined for each mycotoxin.

- Non contaminated Ingredients: Level of mycotoxins were found to be below LOD (limit of detection). These ingredients were considered as normal samples.
- Contaminated ingredients: Level of mycotoxins were more than LOD, but less than maximum tolerance limit (above risk level). These ingredients were considered as positive samples.
- Above Risk Level: Level of mycotoxins were found to be more than tolerance limits & can impose serious threat on consumption.

Various studies have established that ingredients having below LOD mycotoxin can also exert negative impact on animal performance due to synergistic & additive effects of multiple mycotoxin.

A total of 540 raw ingredient sample were analysed for the survey. The percentage of contaminated samples and risk levels for each mycotoxin is represented in Figure 1.

Aflatoxin & T2 were most prevalently found mycotoxin in ingredients with 42% and 40% above risk (tolerance) level respectively. 21% ingredients were found to be normal and 38% samples were contaminated with aflatoxin. Only 16% ingredients were without T2 contamination and 57% were contaminated with T2. Ochratoxin contamination was found in 75% of samples and with 8% sample above risk level. The fumonisin contamination was the least in 17% of samples and with 10% samples above the risk levels.



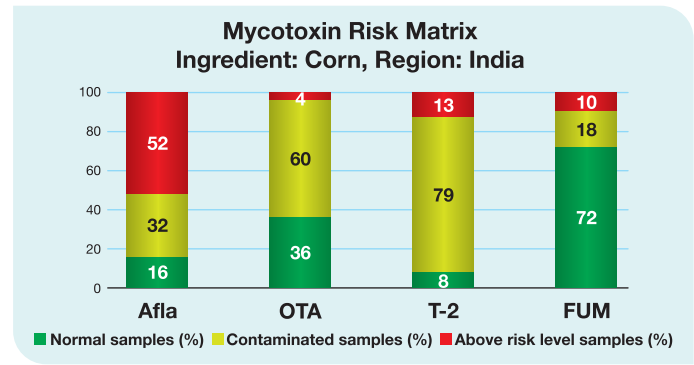
	Aflatoxin	Ochratoxin	T2	Fumonisin
Average (ppb)	53	18	320	1011
Maximum (ppb)	640	1007	3668	84410

Figure 1: Sample: All selected ingredients - Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

After getting the overall mycotoxin contamination pattern,

we analysed the levels of mycotoxins in each feed ingredient. The resulting patterns are depicted from Figures 2 to 7 showing normal samples, contamination samples and above tolerance level for each mycotoxin.

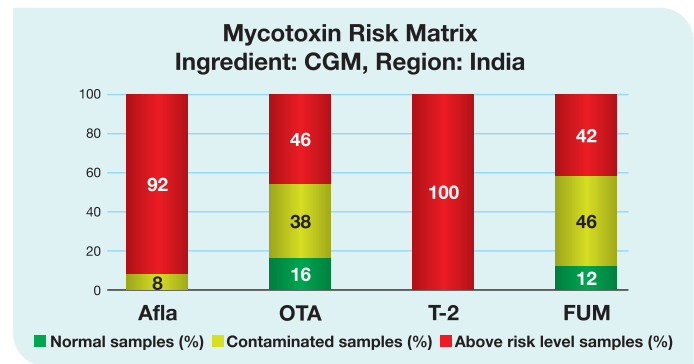
Aflatoxin contamination was found to be higher for corn and 52% samples were above risk level that was very critical as corn is predominantly used in animal feed. Ochratoxin, followed by fumonisin is having comparatively less contamination. (Figure 2)



	Aflatoxin	Ochratoxin	T2	Fumonisin
Average (ppb)	86	7	129	329
Maximum (ppb)	640	100	1180	5110

Figure 2: Sample: Corn - Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

Corn Gluten Meal samples were found infested with all types of mycotoxins studied. T2 & aflatoxin were found to be predominant followed by fumonisin & Ochra. High contamination could be due to improper processing and poor storage. (Figure 3)



	Aflatoxin	Ochratoxin	T2	Fumonisin
Average (ppb)	116	27	563	5503
Maximum (ppb)	455	174	2114	84410

Figure 3: Sample: Corn Gluten Meal (CGM) - Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

In general, DDGS samples were found to be the most contaminated with mycotoxins. 98% samples were above risk level for aflatoxin & T2, in which not a single sample was without contamination. Even 71% DDGS samples were contaminated with ochratoxin having 27% above risk level (Figure 4).

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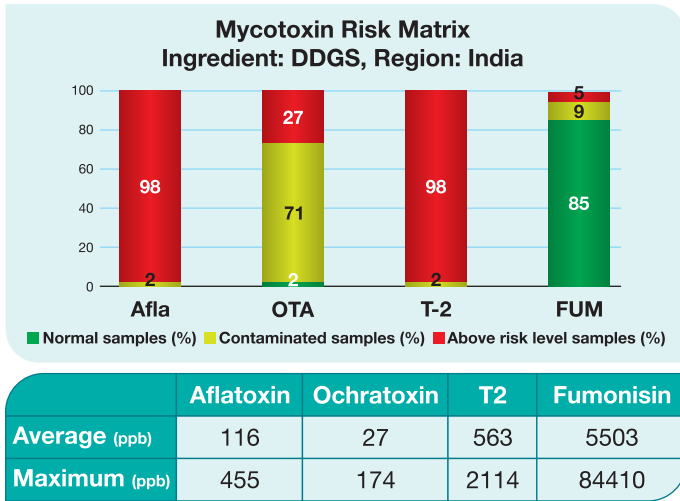


Figure 4:Sample: Dried Distillers Grain Soluble (DDGS) -Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

In Mustard DOC, T2 mycotoxin contamination intensity was highest, 59 % samples were above risk level for T2. (Figure 5). Mustard DOC is comparatively clean ingredient in term of aflatoxin, Ochratoxin & fumonisin contamination.

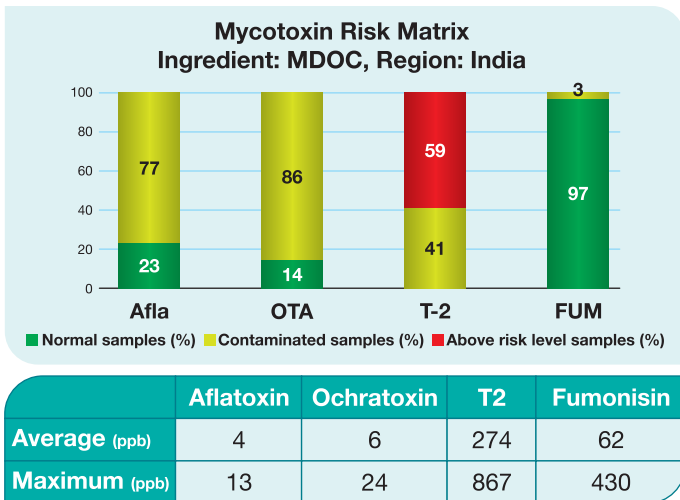
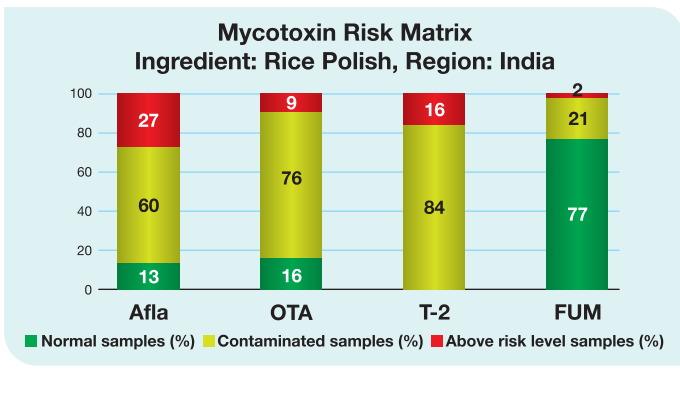


Figure 5:Sample: Mustard De Oiled Cake(MDOC)- Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

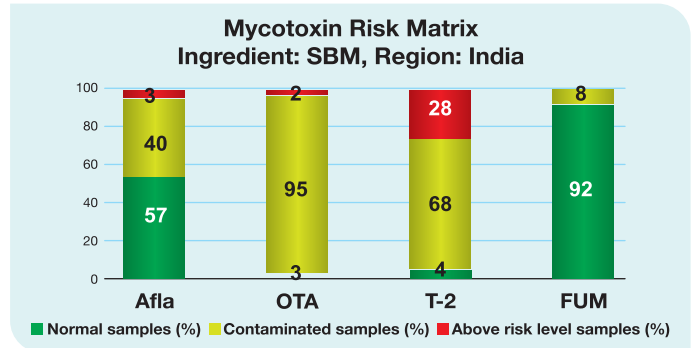
Rice Bran samples were contaminated 60%, 76% and 84% with aflatoxin, ochratoxin & T2 respectively having 27%, 9% and 16% above risk level. (Figure 6)



	Aflatoxin	Ochratoxin	T2	Fumonisin
Average (ppb)	23	15	144	166
Maximum (ppb)	179	79	588	1470

Figure 6:Sample: Rice Bran (Polish) - Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

SBM is always good source of protein and widely used in poultry feed. Our study reveals that 28% samples were above risk level for T2.SBM is comparatively clean ingredient in term of mycotoxin infestation. (Figure 7)



	Aflatoxin	Ochratoxin	T2	Fumonisin
Average (ppb)	23	15	144	166
Maximum (ppb)	179	79	588	1470

Figure 7:Sample: Soya Bean Meal (SBM) - Percentage of normal samples, contaminated samples and above risk level samples for each mycotoxin

After having trend analysis of mycotoxin prevalence of each selected ingredient it was concluded that aflatoxin remains a major concern for all ingredients and can impose serious health issue. CGM & DDGS were infested considerably high with aflatoxin and T2 mycotoxins. SBM & MDOC is comparatively clean ingredient in term of aflatoxin infestation. Level of Fumonisin is comparatively lower than other mycotoxins in all selected ingredients.

2. Presence of multiple mycotoxins in feed ingredients

Multi mycotoxin contamination is an area of concern since it increases the adverse impact of toxins because of their synergistic effect. 95% of analysed samples were found co-contaminated with mycotoxins and only 5% samples were normal samples having level of mycotoxin less than LOD. 17.22 % were contaminated with a single mycotoxin, 30% had presence of two mycotoxins, 35% were contaminated with three mycotoxins and 13% of samples tested positive for all the tested mycotoxins as shown in Figure 8.

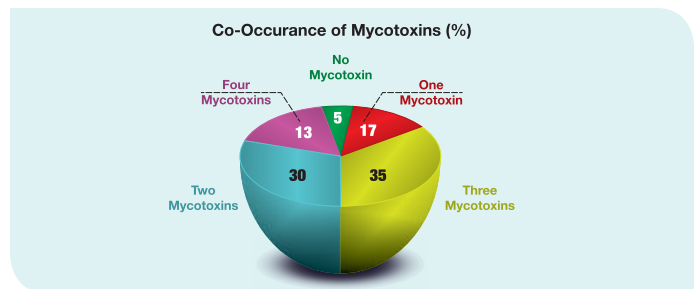


Figure 8: Co-occurrence of mycotoxin in selected feed ingredients (in percentage)

3. Regionwise mycotoxin infestation:

Feed Ingredients were received from various region of India for mycotoxin analysis to get pattern of mycotoxin prevalence.

Region	East	North	South	West
No. of Samples	94	218	87	141

The results of the analysis are displayed in Figure 9-12:

Samples received from the eastern region of India comprising of the states Bihar, Jharkhand, Orissa, West Bengal reflected a high contamination (above risk level) with T2 followed by aflatoxin. All DDGS & CGM samples were above risk level for aflatoxin and T2 & Aflatoxin. (Figure 9)

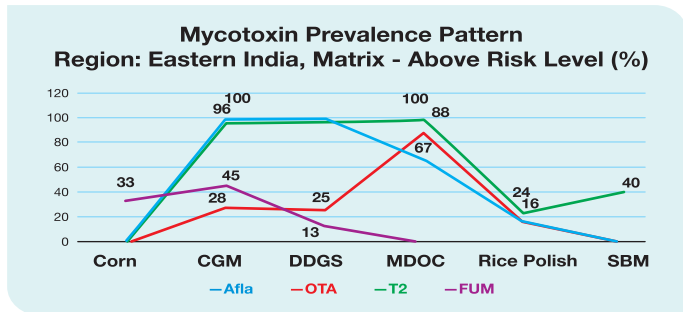


Figure 9: Region - Eastern India - Percentage of samples which were above risk level samples for each mycotoxin

The results of the samples received from the northern region of India, which comprises of Punjab, Haryana, Uttar Pradesh, Uttarakhand, Himachal Pradesh states indicated contamination by T2 and Aflatoxin. Here also, all DDGS and CGM samples were above risk level for aflatoxin and T2. SBM was comparatively clean ingredient. (Figure 10)

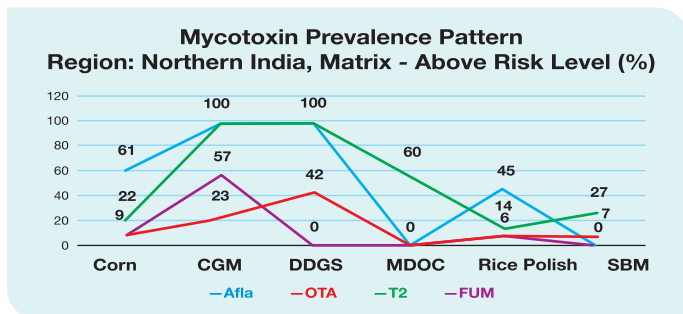


Figure 10: Region - Northern India - Percentage of samples which were above risk level samples for each mycotoxin

In South Region, which comprises of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu & Telangana states, T2 was major cause of concern for CGM, DDGS & MDOC in southern India as well. Rice polish and SBM were comparatively clean ingredients. (Figure 11)

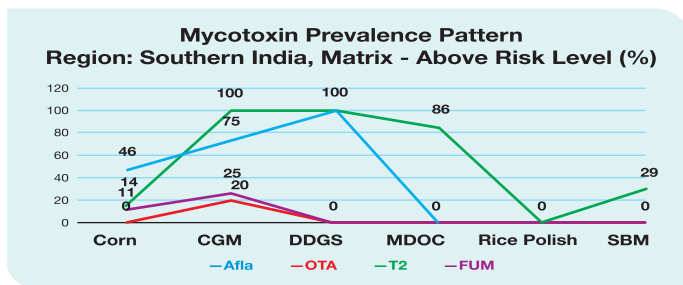


Figure 11: Region - Southern India - Percentage of samples which were above risk level samples for each mycotoxin

In West Region, which comprises of Goa, Gujrat, Maharashtra, Chhattisgarh, Rajasthan, Madhya Pradesh; DDGS was highly infested with aflatoxin and T2 (Figure 12).

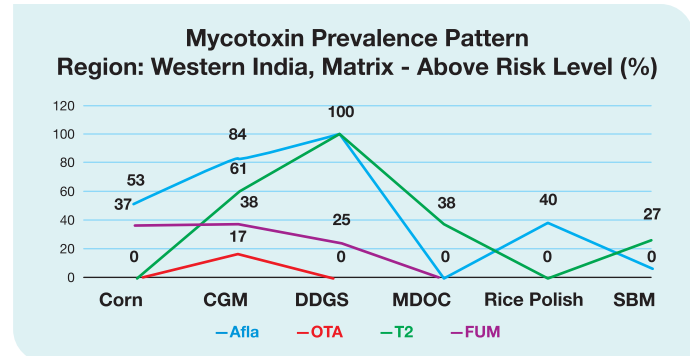


Figure 12: Region - Western India - Percentage of samples which were above risk level samples for each mycotoxin

Conclusions

This report of the survey showed the prevalence of mycotoxins in common feed ingredients used in the livestock production industry in India. In the feed ingredients samples tested, the levels of mycotoxin were higher than the risk levels guidance values. Among all feed ingredients, level of aflatoxin contamination was high. The feed ingredient corn gluten meal had a high infestation of mycotoxins. More than 96% of the feed ingredients were co-contaminated with mycotoxins.

Regionwise mycotoxin survey of the feed ingredients from all the Northern, Southern, Western and Eastern regions of India had shown presence of multiple infestation of mycotoxins.

Analysis of the mycotoxin risk is critical for providing recommendation and advice on quality control of the various raw material and ingredients. A special focus needs to be given to prevent the adverse impact of mycotoxins in animal health and performance. The mycotoxin survey conducted by Provimi (India) is going to be an important tool to approach the mycotoxin risk management for the poultry producers in India.

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Simulation of chicken probiotic biology: invitro vs invivo

Dr Susim Mukul Ray

Group Product Manager, Zydus AH, Div of Cadila Healthcare Ltd



The poultry gastrointestinal tract can be compartmentalized into three distinct microbiome based on oxygen

and carbon-dioxide tension. It is leveraged by several different factors like

- Differential anatomy and physiology of chicken gut leading to spatial and temporal differences in digestion
- and absorption of various nutrients
- Fast growing aerobes and facultative anaerobes in early part of chick's life (Day 1-12) consuming oxygen
- and ending up in higher carbon dioxide tension in hind gut
- Overgrowing of facultative anaerobes in mid & hind gut replacing aerobes
- Dominance of obligatory anaerobes in hind gut by second week of chick's life

Finally, by day 12 the gastrointestinal tract of chicken shelters complex plethora of microorganisms viz, aerobes, facultative anaerobes & obligatory anaerobes.

Invitro probiotic biology

When probiotics are grown in a batch culture, the resulting growth curve usually has four phases: lag, exponential (log), stationary, and death (Fig 1).

- Lag phase: When microorganisms are introduced into fresh culture medium, usually no immediate increase in cell number occurs. This period is called the lag phase. It is not a time of inactivity; rather cells identify new environment (e.g. new media) and synthesize new component essential for proliferation (doubling i.e. from one to two).
- Exponential phase: During the exponential (log) phase, probiotics start growing and dividing at the maximal rate possible given their genetic potential, the nature of the medium, and the environmental conditions. The growth rate is constant during the exponential phase i.e., they complete cell cycle and double in numbers at regular intervals. Thus, this phase of growth essentially requires more energy input which is leveraged by aerobic/anaerobic respiration (36-38 moles of ATP produced per cycle) only.
- Stationary phase: In a closed system such as a batch culture, population growth eventually ceases and

- growth curve becomes horizontal owing to several factors like nutrient depletion, limited O₂/CO₂ tension
- (e.g. aerobes & anaerobes), accumulation of toxic waste products, population reaching critical level in numbers etc. This is called stationary phase. The transition of log phase to stationary phase requires
- lower energy inputs. Thus, during this transition maintenance energy required is leveraged by fermentation (2 moles of ATP per cycle).
- Death phase: During death phase, number of viable cells decline exponentially, with cells dying at constant rate. There are two alternative events - a) Viable but nonculturable (VBNC) cells result when they are only temporarily unable to grow, at least under laboratory conditions used. Once the appropriate conditions are available (e.g. change in temperature or passage through host), VBNC probiotics resume
- growth. b) Programmed cell death occurs in a fraction of the microbial population and leaks nutrient
- enabling eventual growth of those cells in the population that did not initiate cell death.

Invivo probiotic biology

Within chicken gut, the environment differs significantly from laboratory (invitro) conditions. Based on various research data published on life cycle of probiotics in chicken gut, it however, turns out that the phases of growth curve has considerable resemblances and may be classified into four phases - lag, exponential (log), stationary/challenge & sporulation & feed passage (Fig 2a & 2b). For better elucidation of the invivo growth curve, let us consider the example of *Bacillus subtilis*, the widely used probiotic in poultry feed.

- *Bacillus subtilis* enters chicken gut predominantly in endospore form. Specialized receptors in spores identifies favourable environment (e.g. nutrient, oxygen tension etc.) and germinates into vegetative cells. It has been reported that upto 90% of spores fed to chicken can germinate within an hour in crop to gizzard section of gut (upper GIT) possibly owing to favourable conditions for

aerobes (higher O₂ tension). It is followed by colonisation on gut epithelial cells and preparation for proliferation. This phase of probiotic life cycle within chicken gut can be defined as lag phase. Number of spores per gram of feed and rate of germination within same period of time significantly influences the population density in next phase.

- The exponential (log) phase of *Bacillus subtilis* in chicken gut is shorter than the *in vivo* conditions. This is owing to continuous feed passage, cellular sloughing, competition with other microorganisms and hostile gut environment. However, the rate of germination as mentioned earlier and feed retention in crop triggers fast doubling of cell number enough to create own ecological niche. In fact, few research reports suggest *Bacillus subtilis* undergoes full cycle of germination and sporulation during its journey from crop to cloaca.
- The transition of log phase to stationary phase for *Bacillus subtilis* is critical to envisage the benefits of using probiotics. Unlike *in vivo* conditions where this phase is precipitated primarily by nutrient depletion, in chicken gut, it is owing to decreasing O₂ tension in lower GIT and competition evoked by other bacteria/fungi. Report published on *Bacillus subtilis* suggests that during the transition state it excretes several enzymes (to degrade complex substrates), immunomodulators (systemic resistance), antibiotics, bioactive compounds (e.g. lipopeptides) etc., to kill competitors and preventing them from invading its ecological niche. These substances are produced by fermentation which simulates their biology in *in vitro* conditions (e.g. penicillin & enzyme production). Interestingly, in commercial broiler trials, insignificant difference in growth performance parameters (e.g. BWG & FCR) between probiotic control (*Bacillus subtilis*) & negative control may be suggestive of lack of stationary phase in chicken gut. Moreover, lack of stationary phase often leads to overgrowth of probiotics resulting in competition with host (poultry) nutrition. Such incidences are recorded in several field trials (Fig 3 & Table 1) where treatment group performs significantly better in lower inclusion level.
- Sporulation is usually considered the last resort to be embarked upon when all other attempts to grow, compete and survive have been exhausted. Various research workers have reported that sporulation tendency of *Bacillus subtilis* increases in chicken hind gut (ileum to cloaca) relative to upper-&mid gut (crop to jejunum). Such response has been attributed to factors like strict anoxic (CO₂) condition, elevated NH₃ concentration, efficient nitrate/amino acid/nutrient utilisation by obligatory anaerobes (e.g. *Clostridium perfringens*) outrunning *Bacillus subtilis*.

Multi-strain probiotics are effective than single strain and performs better in lower inclusion level

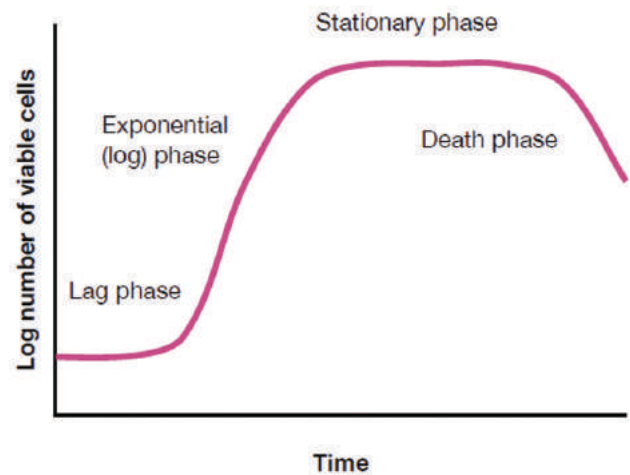


Fig. 1. Probiotic growth curve in closed system/*in vitro* conditions

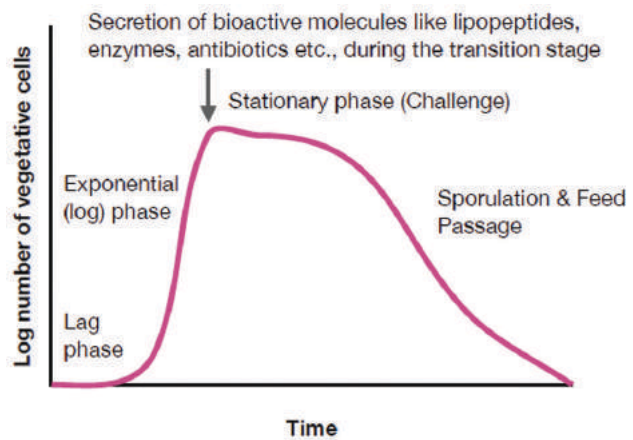


Fig. 2a. Hypothesised growth curve (in challenging environment) of *Bacillus subtilis* in chicken gut based on published data and one time feeding of spores

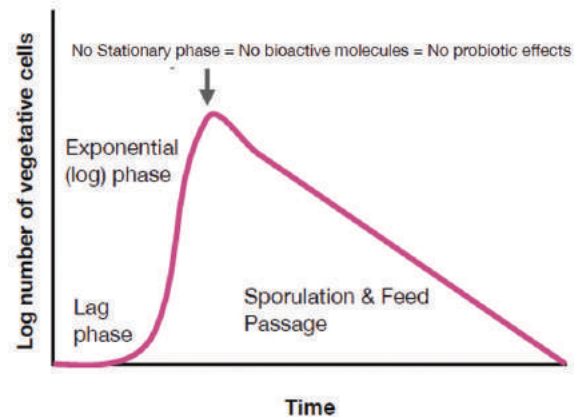


Fig. 2b. Hypothesised growth curve (without challenge) of *Bacillus subtilis* in chicken gut based on published data and one time feeding of spores

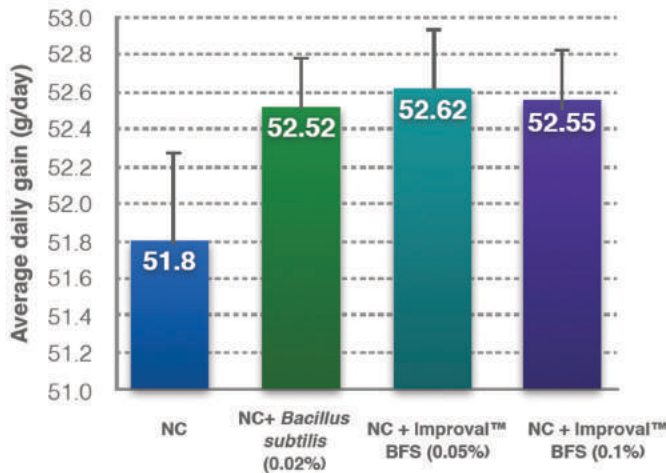


Fig. 3. Average daily gain in broiler (Day 0 - 42) fed single descript strain of *Bacillus subtilis* (0.02%) & Improval™ BFS (0.05% & 0.1%)*. Improval™ BFS = Microencapsulated spores of *Bacillus subtilis*, *Bacillus coagulans*, *Bacillus licheniformis*, *Clostridium butyricum* HJCB998 (Total potency NLT 5 X 10¹¹/kg), NC = Negative control

Table 1. Villus height and crypt depth in the experimental birds at day 42 (Male birds, Jejunum only)*

Parameters	NC	NC + <i>Bacillus subtilis</i> (0.02%)	NC + Improval™ BFS (0.05%)	NC + Improval™ BFS (0.1%)
Villus height (µm)	634.1	657.6	659.1	648.4
Crypt depth (µm)	187.4	198.8	189.7	189.8
Villus height : Crypt depth	3.39	3.32	3.49	3.47

Mean of 10 male birds from each dietary treatments (one bird from each pen)

*Source: Zydus AH R&D trial data

Conclusion

- Vegetative form of probiotics is biologically important for poultry.
- Considering the short feed passage time in poultry, spore forming probiotics must germinate fast in concurrence to vegetative form.
- Well defined log phase in chicken gut should be followed by stationary phase to yield beneficial bioactive molecules.
- single strain probiotics like *Bacillus subtilis* tends to sporulate in hind gut thereby undergoes feed passage. Hence, competitive exclusion of *Clostridium perfringens* is not possible leading to unaddressed threat of necrotic enteritis from day one.
- In field conditions, multistrain probiotics (strategic combination of aerobes & anaerobes) are
- more effective at lower inclusion level relative to Single strain. It is probably because of enhanced stationary phase yielding beneficial bioactive molecules, amplifying protective spectrum against microbial infections and better utilisation of gut microbiome.

(References available from author on request)

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