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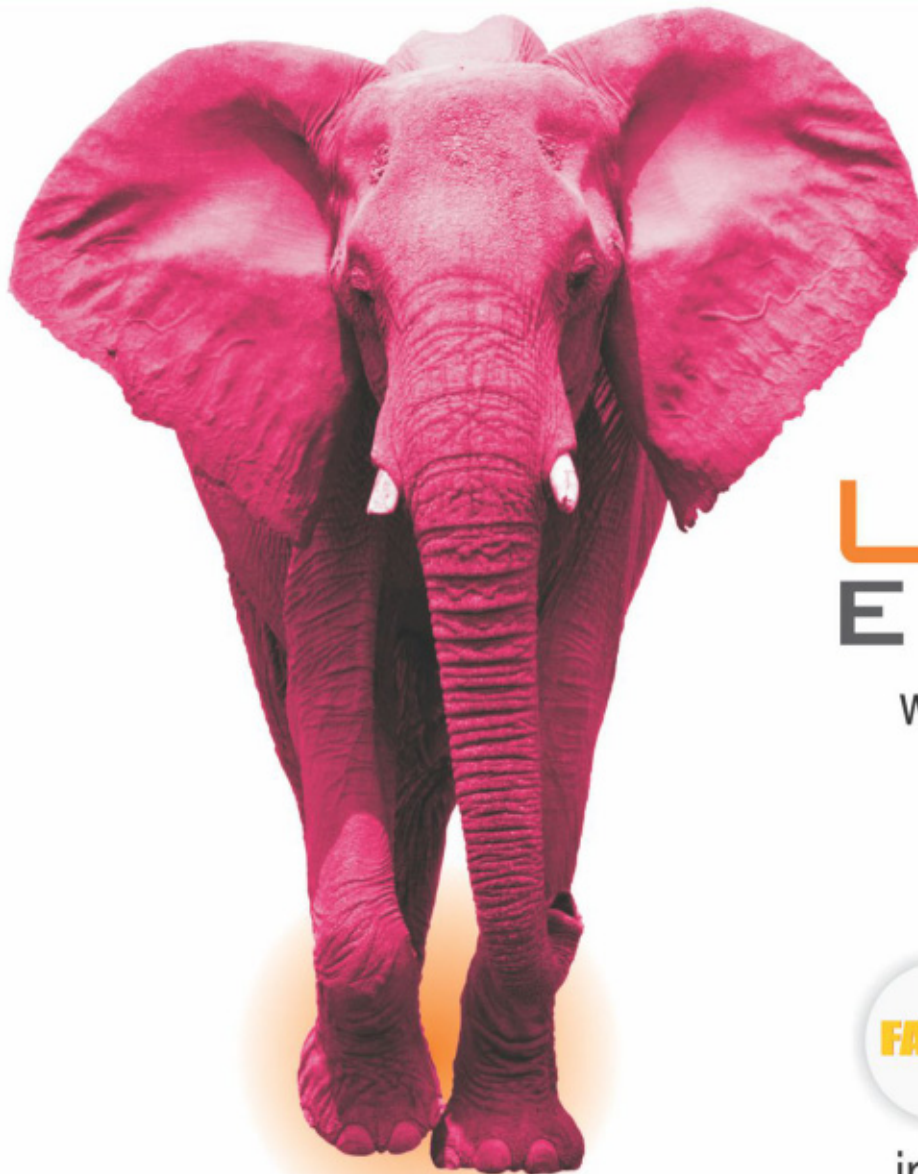
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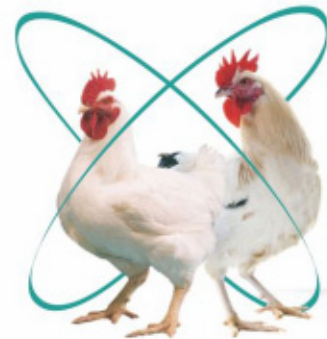
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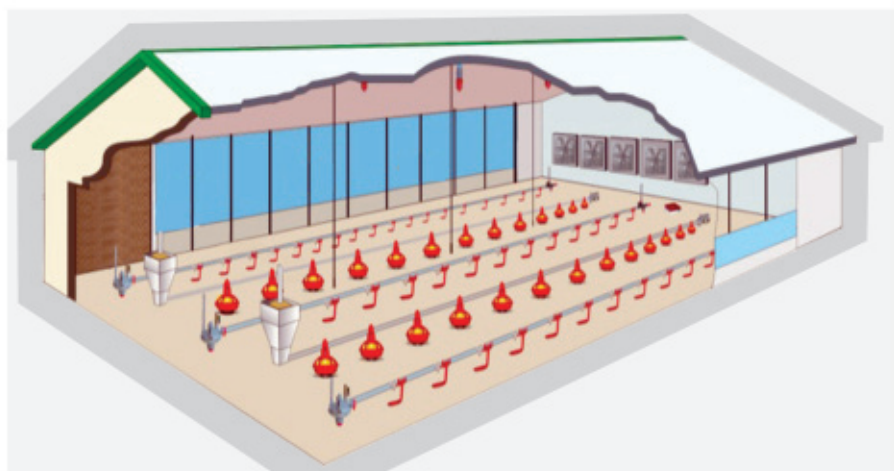
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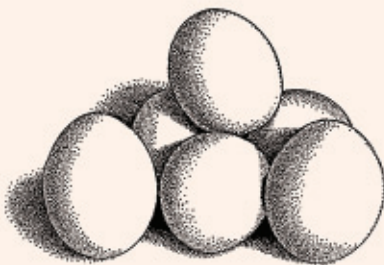
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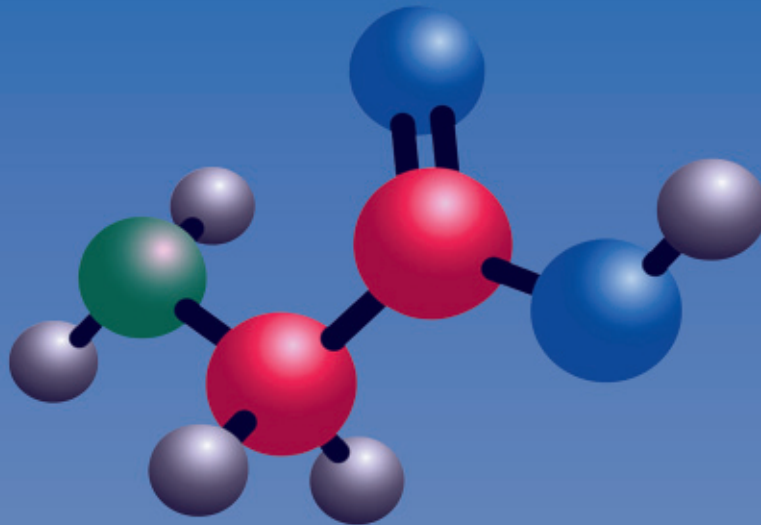
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Mustard Seed Meal as a Source of Protein for Poultry Feeding

A.K. Panda, Principal Scientist, ICAR-Central Institute for Women in Agriculture, Bhubaneswar, 751003, Odisha. Email: akpanda59@gmail.com

The success of commercial poultry production depends primarily on the quality of the bird, comforting environment and the provision for good feed, the last being most expensive of all other inputs, deserves befitting attention. Feed accounts for 70-80% of the cost of production in poultry. The major function of feed is to provide the farmer with cost effective diets that meet the nutrient requirement of the particular stock of birds. Besides a literal supply of well-balanced feed its effective utilization by the bird is important. Soybean meal

(45% CP) is the choice protein source in poultry feed. The quality of protein is highly suitable for poultry. However, the price of soybean meal (SBM) has increased substantially in a short span of time, forcing the poultry producers to look for alternate protein sources for poultry feeding. One such protein source is mustard seed meal.

Mustard/Rapeseed meal

Mustard is also known as “rapeseed” belongs to the family *Cruciferae* and genus *Brassica*. It is suitable to be grown in regions that have colder climatic conditions. The growth of rapeseed is most vigorous in temperature between 10° and 30°C with optimum around 20°C. It is cultivated as rabi crop in Assam, Bihar, Haryana, Orissa, Punjab, Uttar Pradesh and West Bangal. Well developed rapeseed contains 40 to 44% oil. Mustard seed meal (MSM) is a fairly good source of crude protein (34-36%), lysine (1.0-2.0%) and methionine (0.90-1.20 %). The availability of MSM is around 4.2 million metric tonnes in India. The utilization of MSM in poultry diet is limited due to presence of glucosinolates (99-144 micromoles /g), erucic acid (>2%), tannin and higher crude fibre.

Nutrient composition of Rapeseed meal vs Soybean meal

Solvent extracted mustard seed cake is fairly good source of protein (34-36%) and energy (2200 kcal ME/kg), low in lysine (1.94%) but rich in methionine (1.1%) compared to SBM. The crude fibre content is high (11-12%). The quality of mustard protein is slightly better than that of the protein in groundnut meal. The nutrient composition of MSM and SBM is given in Table 1.

Table 1. Nutrient composition of oilseed meals (90% DM basis)

Nutrients	Mustard seed meal	Soybean meal
Crude protein	34.0	45.0
Crude fat	1.0	1.0
Crude fibre	12.0	3.9
Linoleic acid	---	0.3
Minerals		
Calcium	0.68	0.20
Non phytate phosphorus	0.30	0.37
Sodium		0.05
Potassium	1.29	2.55
Chlorine		0.05
Amino acids		
Lysine	1.94	2.91
Methionine	1.01	0.72
Methionine + cystine	1.58	1.51
Threonine	1.53	1.96
Tryptophan	0.44	0.71
Arginine	2.08	3.60
Leucine	2.47	3.74
Isoleucine	1.37	2.12
Valine	1.76	2.22
Histidine	0.93	1.28
Phenyl alanine	1.44	2.34
AMEn (kcal/kg)	2200	2440

Utilization of MSM in Poultry diets

Due to the presence of anti-nutritional factors like glucosinolates, erucic acid, tannin and higher crude fibre, the use of MSM as a source of protein in poultry diet is limited. It can be used up to 10 and 5% in the diet of broiler and layer chicken, respectively. The toxic principles present in MSM interfere with fat metabolism leading to fat accumulation and enlargement of liver. Glucosinolates have goitrogenic effect, interfere with the activity of thyroid gland and thereby iodine metabolism. Iodine supplementation is not effective; while copper supplementation is beneficial in high level MSM based diets. Additional copper minimized erucic acid toxicity.

The solvent extraction process reduces goitrogenic effect and removes most of the erucic acid from the meal. There may be some problem with the palatability of mustard meal based diets due to the presence of sinapine (1.5%). Sinapine is a methylated substance, which is converted to trimethyl amine and is then absorbed by the animal. This is a significant problem in brown egg laying hens as they produce eggs with a fishy odour in MSM based diet. The egg taint is due to the presence of excessive amounts of trimethyl amine. If inclusion level is higher than 5% in layer diet, it may result in a fishy taint or off flavor on the egg yolk. This is due to the presence of a choline ester, sinapine which promotes the accumulation of trimethyl amine in the yolk. Above 10% inclusion in diet, haemorrhagic fatty liver is often observed associated with higher mortality.

Canola meal

Canola meal is a variety of rapeseed/mustard seed in which the levels of glucosinolates and erucic acid has been reduced significantly through genetic selection. Canola is widely grown in Canada, however, the crop has spreads to many parts of the world. The goitrogen levels in Canola have brought down to less than 20µg/g which is of little or no problem to the bird. Erucic acid contents are

also negligible. The canola variety in which both glucosinolates and erucic acid have been reduced significantly is known as “**double zero varieties**”. Double zero varieties have been accepted as a high quality protein meal by the poultry feed industry.

Utilization of Canola meal in Poultry diets

When diet is formulated on the basis of digestible amino acids, canola meal can be included upto 30% in the broiler diet without negatively affecting growth rate and feed efficiency. Thus canola meal is a potent alternative source of protein to SBM in the broiler diet. In the past, the inclusion of canola meal in layer diets was limited to less than 5%. This was due to the toxic principles (residual glucosinolates) which resulted in liver hemorrhage mortality that occurred with higher levels of inclusion. However, with the development of double zero variety of canola meal, the same can be included upto 20% in the diets of laying hens with no increase in the incidence of liver hemorrhagic mortality. Care must be taken when canola meal is incorporated in the diets of brown egg layers because of an increase in fishy flavor that results in the eggs. Canola contains high levels of choline and sinapine, precursors of trimethylamine.

Conclusions

The utilization of mustard/rapeseed meal in poultry is limited due to the presence of various incriminating factors like glucosinolates, erucic acid, tannin and higher crude fibre. It can be used up to 10 and 5% in the diet of broiler and layer chicken, respectively. The development of double zero varieties of canola meal has led to higher level of inclusion in poultry diets (broiler-30% and layer-20%) without any adverse affect performance of poultry. Hence, canola meal can be a potential alternative to soybean meal in poultry feeding. The author believes that if canola crop can be promoted in this country, then the dependency on SBM as a source of protein can be mitigated to a greater extent.

FEED GRANULOMETRY AND THE IMPORTANCE OF FEED PARTICLE SIZE IN LAYERS

INTRODUCTION

Feed particle size is an often-overlooked aspect of poultry production. Producers should not assume that feed is of a uniform size and homogeneously mixed, or that the feed mill is providing the ideal mix of particles in a ration. Feed particles range in size from very fine to coarse, and different grinding methods will result in different particle size distributions. Differences in particle size within a ration can affect both the digestive system and the performance of the bird, even if the overall nutrient values are similar. Producers, therefore, should frequently evaluate feed particle size distribution and be mindful of the many variables that can affect it.

THE EFFECT OF FEED PARTICLE SIZE ON THE DIGESTIVE SYSTEM

Digestive tract development is influenced by feed particle size. Birds consuming feed with large particles will develop larger and more muscular gizzards and longer intestinal tracts. Larger feed particles require more time in the gizzard to grind feed into smaller particles before they can enter into the small intestine. Larger feed particles have a longer transit time through the intestine. The length of microvilli in the intestine is greater, which increases the absorptive surface area, and thereby positively affects digestibility and nutrient absorption. Some researchers have speculated that the inclusion of larger feed particles in the diet increases localized digestive enzyme secretion in the small intestine, which benefits overall nutrient digestibility.

When the diet is composed of predominately fine particles these smaller feed particles quickly pass through the gizzard without grinding and pass into the proventriculus. The result is a small gizzard, enlarged proventriculus and reduced intestine length. Diets containing excessive levels of fine particles should not be fed.

OPTIMAL FEED PARTICLE SIZE

Feed particle size of the diet plays an important role in regulating the feed intake by the bird. Optimal feed particle size increases with age with development of the beak, gizzard and digestive tract. The laying hen has a preference for larger particles, and the preference grows stronger with age.

For the first six weeks, a starter diet is generally given as a crumble, which is made by breaking up pellets consisting of fine particles into a crumble size of 1–3 mm. Crumbled feed is ideal for young chicks because each crumb is a composite of different constituents of the diet. Continued provision of crumbs beyond the starter diet reduces the length of the small intestine and size of the gizzard.

After the starter diet, a well-textured mash (meal) diet is preferred. This ensures proper development of the digestive tract. Well-textured mash (meal) diet has 55–85% of the feed particles between 1 and 3 mm in diameter, with an approximate Geometric Mean Diameter (GMD) of 1200 microns (see Figure 1). Beginning with the pre-lay diet, a well-textured mash diet includes large particles of limestone (2–4 mm diameter). Large particle limestone is needed to maintain good eggshell quality.

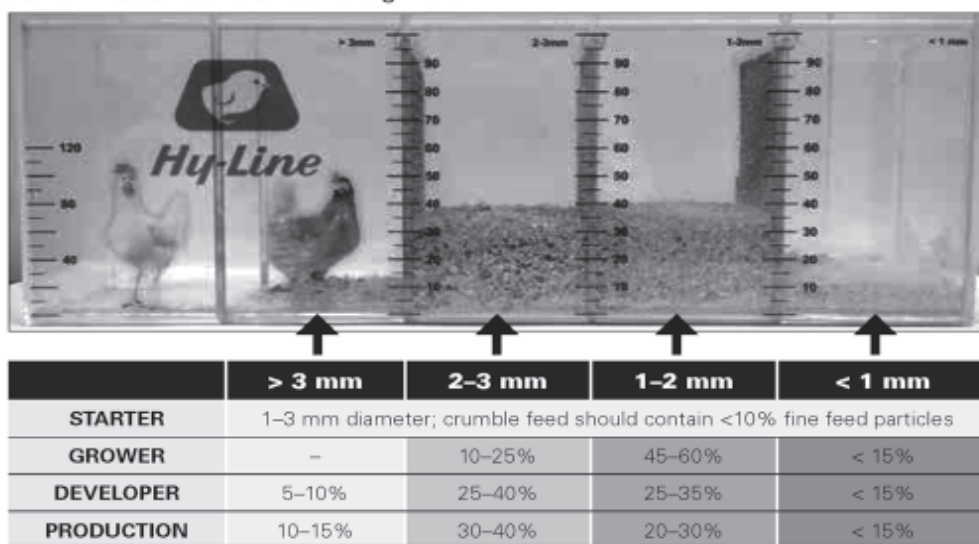


Figure 1. Optimal feed particle profile using the Hy-Line Sieve Shaker.

Technical Update – FEED GRANULOMETRY

SELECTIVE EATING BY BIRDS

Mash (meal) feed is generally a mixture of coarse and fine particles. Birds preferentially consume larger feed particles. These large particles are frequently coarse-ground corn, which is an important source of gross energy. Fine feed particles usually contain the synthetic amino acids, phosphorus, vitamins and trace minerals. The vitamin/mineral premix is usually fine particle. Birds that overconsume larger feed particles generally have high energy intake and low intake of other important nutrients, such as Vitamin A, vitamin D, riboflavin, sodium, lysine and methionine. Many egg production and shell quality problems are due to inconsistent nutrient intake caused by selective eating.

Birds that are fed too often or in excessive amount are not encouraged to eat the fine feed particles. Fine particle feed can accumulate in the feeders if not properly managed. Encourage the consumption of fine feed particles by leaving a gap of 2–4 hours mid-day. This allows birds to clean the feeders and consume fine particles during this time. Farmers should monitor the feed bins and feeders to assess feed disappearance to determine the appropriate feeding frequency and feed depth that optimizes the daily consumption of both large and small feed particles.

It is important that birds consume both large and fine feed particles on a daily basis to ensure a balanced nutrient intake.

GRANULOMETRY (DETERMINING FEED PARTICLE SIZE)

The standard method for determining particle size is The American Society of Agricultural Engineers (ASAE) procedure S319.1. (<http://animalscience.unl.edu/Research/RumNut/RumNutLab/21-ParticleSizeAnalysis.pdf>). The procedure involves passing feed or ingredients through a series of 14 screens (sieves) of progressively smaller diameter for 10 minutes. The results are reported as Geometric Mean Diameter (GMD) and a measure of particle size uniformity (standard deviation or coefficient of variation [CV]). Properly manufactured feed should have a CV of less than 10%. This procedure is normally only done by large feed mills.

For evaluation of feed particle size on the farm Hy-Line has its own hand-held sieve shaker that can determine particle distribution of mash feeds (Figure 1). This is a useful tool for farmers to check feed deliveries from the feed mill and check particle size in the birds' feeder.



Figure 2. Test sieves. Image courtesy Gilson Company, Inc.

<http://www.globalgilson.com/test-sieves>

THE EFFECT OF MILLING PROCESS ON FEED PARTICLE SIZE

Raw material particles undergo multiple changes through the feed milling process. The biggest factor affecting particle size is how the diet is milled. Raw materials, such as soybean meal, fishmeal and premixes, are usually in a form that do not require further particle size reduction. Cereal components (i.e. corn, wheat and other whole grains) of diets always undergo a grinding process. Different ingredient types will behave differently when ground. For instance, wheat will produce a different particle size than corn run through the same grinder.

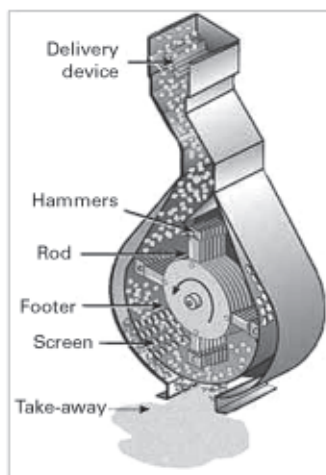


Figure 4. Hammer mill. Image courtesy CPM Roskamp Champion.



Figure 3. Sieves of varying sizes used to separate a mash feed sample by particle size. Image courtesy Gilson Company, Inc.

Hammer and roller milling are two of the most common methods used to grind raw materials.

Hammer mills (Figure 4) are comprised of rotating sets of hammers that use impact force to break down the grain. The hammers rotate at high velocity and break down the material until it can pass through the surrounding screen. Particle size and uniformity produced by a hammer mill depends on the size, shape, speed and wear of the hammers, as well as the type and diameter of the screen used. Hammer mills are able to produce a wide range of particle sizes. They work well with fibrous materials like wheat by-products.

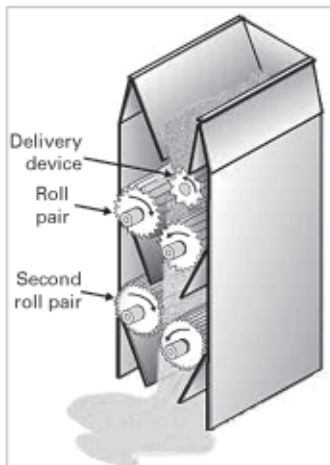


Figure 5. Roller mill. Image courtesy CPM Roskamp Champion.

Roller mills (Figure 5) utilize cylindrical rollers, usually in pairs, to compress and shear (tear) grains into smaller particles. Feed passes through a series of 2–6 roller pairs which have corrugations or grooves cut into the surface. One roller typically rotates faster and in the opposite direction to create shearing force. Particle size is determined by the number of rollers, distance between rollers, roller diameter, speed and corrugation pattern. Generally, roller mills grind grain into more uniformly sized particles than hammer mills (Figure 6).

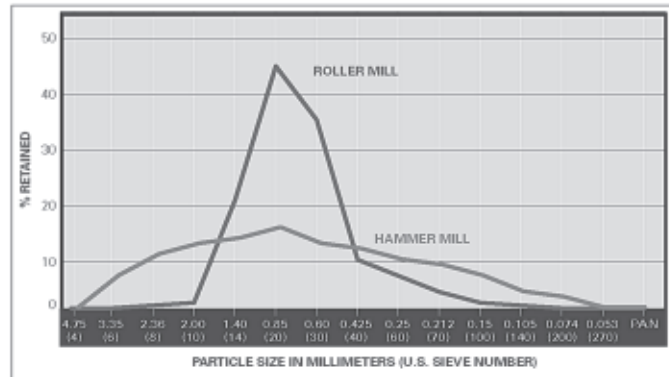


Figure 6. Difference in particle size distribution between a hammer mill and a roller mill. Generally, more uniform particles are produced in a roller mill. Data: M. Heimann, American Soybean Association, 2008.

FEED DELIVERY SYSTEMS

There are three methods of delivering feed in automated feeding systems.

Chain type feeders (Figure 7) - feed is distributed by dragging feed around the feed system with a chain. Chain feeders can cause feed particles to separate by size as it moves feed. The chains can grind the feed particles while being conveyed through the system, although new chain type systems minimize this effect. Slow-moving chain feeders might be problematic as birds at the beginning of a feed line can select out the larger feed particles.



Figure 7. Chain feeder.



Figure 8. Auger feeder. Image courtesy Chore-Time.

Auger type feeders (Figure 8) - an auger is used to distribute the feed. The auger moves feed more rapidly with less feed particle separation and grinding than with chain feeders. Auger feeders typically deliver less feed volume than chain feeders with each feeding.

Hopper type feeders (Figure 9) - a traveling hopper distributes feed by moving down the feed line, dropping feed by gravity. This system causes minimal separation and grinding of feed particles compared to other types of feeders.



Figure 9. Hopper feeders drop feed directly into the feed trough. Image courtesy Alaso.

Management of the feeders is important to minimize the negative effects of feed particle separation and prevent the accumulation of fine feed particles. Frequent feedings of smaller quantities minimizes the accumulation of fine feed. Chain feeders generally deliver a larger volume of feed, making the accumulation of fine particles possible. Allowing the birds to clean the feeders daily will prevent the accumulation of fine particles. Ensuring that there is enough feeder space for all birds to eat at one time will create more uniform nutrient intake in the flock.

Each system has potential feed particle segregation issues that must be monitored by farm managers. Drag chain systems have more side-to-side segregation, where the fine particles are concentrated in the middle of the trough, but the larger particles congregate near the trough walls. In auger systems, there is more top-to-bottom segregation, with fine particles settling at the bottom of the trough and the larger particles remaining near the feed surface. Repeated cycling of the auger can reduce this separation.

TROUBLESHOOTING

Problem	Cause	Result	Remedy
Feed won't auger into the house	Excessive use of bulky feed materials (rice bran, wheat bran); excessive fine feed particles	Feed does not move properly in feed system; poor feed distribution in feeders; reduced feed intake	Avoid excessive levels of bulky materials; match amounts of bulky materials with auger size; avoid grinding materials which are already a small particle size, additional grinding creates excessively fine material in the end product
Sticky feed	Feed is too finely ground	Bridging of feed in bins and feed manifolds; sticky feed puts extra work on feed motors and feeder chains, resulting in electrical overload	Grind cereal grains in mash feed to 1000 to 1200-micron average particle size, increase screen size in hammer mills, or change from a hammer mill to a roller mill (or from a single-stack roller mill to a double-or-more-stack roller mill)
	Too much added fat or poor mixing of fat within the mash	Potential fat oxidation; lower feed palatability	Reduce the quantity of liquid fat added to the diet and/or ensure better distribution of fat within the mix; use good mixing technique when adding fat or liquid ingredients to mixer; excessive fine particles exacerbate the effect of feed sticking and form large aggregates
Selective feeding by birds	Excessive levels of large particles in the feed; drinkers and feeders on same side of cage, resulting in dominant birds occupying feeder space	Dominant birds consume too many coarse feed particles, leading to uneven nutrient intake	Provide optimum feed particle size distribution (see Figure 1); CV of feed particles should be < 10%; uniform feed is less likely to desegregate; place drinkers away from feeders to encourage bird rotation between feeders and drinkers; provide more feeder space per bird
Poor particle size distribution in the feed	Excessive conveying of mash diet resulting in separation of dense and bulky materials; additional grinding of feed in feed trough by some feeder systems; slow feeder speed	Separation of feed particles according to density	Use a minimum of 0.5% liquid oil/fat in mash diets to incorporate fine particles and improve particle size distribution
Accumulation of fine feed particles in feed trough	Too many feedings; poor feeder management where birds do not "clean up" fine particles daily	Uneven nutrient intake; fine feed increases house dust; dust can lead to poor air quality and increase respiratory disease	Ensure there is adequate time daily for birds to "clean up" feed between feed runs; do not use feed ingredients which are too dusty; do not grind material which does not need to be ground; remove accumulated fine particle feed refused by birds weekly

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C.H.I.C.K Program:

How the C.H.I.C.K Program helps with continuous improvement of the hatchery process?

Quality Recognition: A step forward in our objective to ensure that all your birds are well vaccinated

Quality management is critical for the agri-food industry to promote food trade and maintain consumer confidence in product quality and safety. When it comes to poultry production, the vaccination process in hatcheries is critical in ensuring that vaccines are properly applied so that the animals are protected to their full potential in the field. As a result, incorporating the vaccination process into a Quality Management system in hatcheries is critical. The Ceva C.H.I.C.K Program Quality Code of Practice, developed in collaboration with Bureau Veritas Group, is now the standard for vaccination services.

Ceva India, C.H.I.C.K Program has been awarded the first quality code of practice recognition from Bureau Veritas.

Ceva's CHICK Program quality seal recognizes that the policies, practices and procedures applied by our teams of professionals guarantee a solid and constant quality in the services offered to the client when they travel to their incubators to monitor the quality of vaccination.

The Bureau Veritas seal of quality, for the subsidiaries that obtain it, guarantees that Ceva offers its clients:

- Qualified teams dedicated to monitoring in ovo and day old chick vaccination quality.
- Delivery of continuous training for customer operators involved in the vaccination process: vaccine storage and handling, preparation, administration quality, equipment maintenance and results monitoring.
- Management of equipment with a preventive maintenance program.
- Regular hatchery visits to contribute to continuous improvement of results.

The C.H.I.C.K Program sees Ceva's specialist teams visiting customer's hatcheries regularly to run a number of tests to check whether vaccines are properly stored, prepared and administered, as well as delivering continuous training to operators. The shared aim with our customers is to have all birds well vaccinated in the hatchery before being sent to farms. Ceva India has a team of over 6 hatchery specialists who work with local hatchery managers using innovative data management tools, to continually track performance and ensure continuous improvement of results. The VSE team is led by Dr. Varun Namdeo and the VSE team visits over 77 hatcheries belonging to poultry producing customers per year. In short the VSE team constantly works with the hatcheries to help the staff, solve issues and most importantly to provide exceptional customer service and overall experience.



From left to right: Mr. Nitin Sahasrabudhe (Sales & Marketing Director), Dr. Anant Wadkar (Country Director) and Mr. Milind Limaye (Technical Director) receiving the Bureau Veritas Attestation of Recognition.

Please contact Ceva if you have any enquiries:

Ceva Polchem Private Limited,
Premises No. 101, First Floor,
Phase II, Manikchand Galleria,
Model Colony, 411016 PUNE - India

PHONE : 020-25670606

www.ceva.com - contact@ceva.com



Ceva Polchem Private Limited India is compliant to the C.H.I.C.K PROGRAM Quality Code of Practice for the implementation of good hatchery vaccination practices in poultry testified by Bureau Veritas Group.



CT814 C.H.I.C.K Program
Quality Code of Practice

CONTROLLED BY BUREAU VERITAS GROUP.

Mastering of good hatchery vaccination practices is now quality approved

A step forward in our in our objective to ensure that all your birds are well vaccinated:

For the first time, a services program for hatcheries has received internationally recognized, quality approval ensuring that the quality services we provide are of the highest possible international standard.

Ceva Polchem Private Limited

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Rossari Biotech Limited, Mumbai organised a Layer Technical Meet at Karnal



Rossari Biotech Limited, Mumbai organised a Layer Technical Meet in association with Central Haryana poultry Farmers association at Hotel Prem Plaza, Karnal on September 19, 2021. The meeting was attended by more than 50 farmers of the association and business partners of the company. Mr Surinder Bhutani, Secretary CHPF association welcomed the ROSSARI team and showed his gratitude for taking up the topic of discussion which matters to managing bird health and production in present times, followed by the welcome address by Mr Sanjay Kumar, AGM - Sales (North).

The key note speaker at the event, Dr Badal Singh (Layer expert) deliberated an insightful presentation on the current challenges in layer production & bird health. In his presentation, Dr Badal, besides

speaking on improving the gut health through nutritional management, emphasised on the prevention and control of diseases having great economical impact on layer industry.

Later, Dr Aashaq Hussain, AGM - Technical Rossari Biotech Limited briefed the audience about the manufacturing capabilities, quality standards and R&D and the core product portfolio with industry applications of Rossari Biotech Limited.

In concluding remarks, Dr Anish Kumar, Vice-president Rossari Biotech Ltd emphasised the importance of gut health & modulations through enzyme & probiotic supplementations in layer diet and also thanked the CHPF Association and business partners for attending and actively participating in the technical meet.





Potential of Essential Oil Blend in Poultry Production

Dr. Koushik De, Technical Services Director- SCA, Novus International

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



Dr. Koushik De

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

When it comes to poultry gut health, coccidiosis and necrotic enteritis are major economic challenges, particularly when present in a subclinical form where symptoms may not be observable. Due to epithelial damage and

inflammation, these subclinical infections reduce feed efficiency and result in an opportunity for potential pathogens.

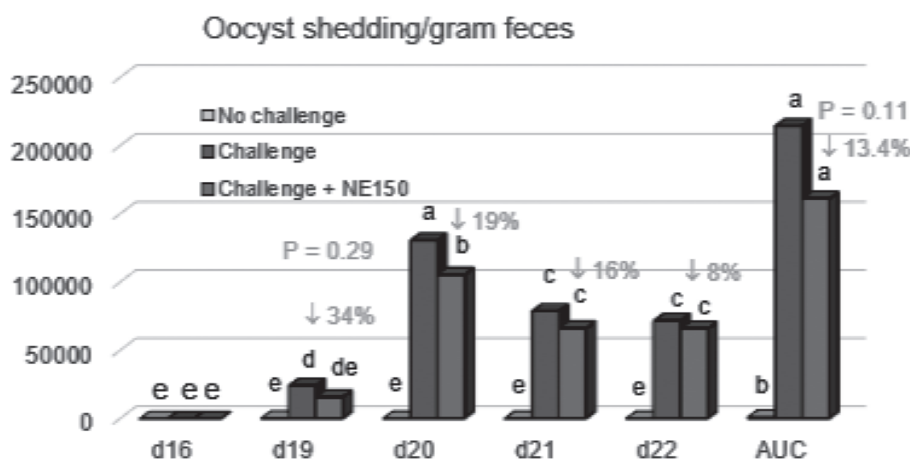
Poultry trials challenged with *Eimeria* and *Clostridium perfringens* showed that NEXT ENHANCE® 150 feed additive – an encapsulated, highly concentrated blend of thymol with carvacrol – promotes healthy intestinal microbial flora, as well as

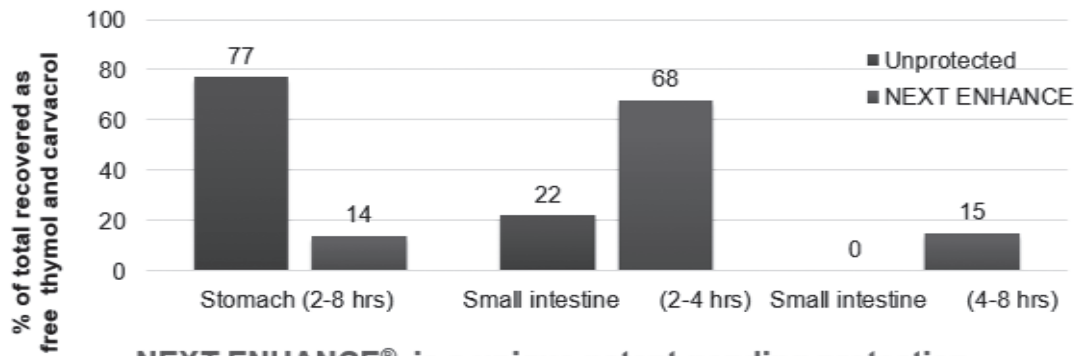
supports gut barrier function, inflammation processes and immunity. NEXT ENHANCE® 150 has a positive effect in the reduction of coccidial faecal oocyst shedding and minimize damage to intestinal epithelium in infected birds. Use of NEXT ENHANCE® 150 for reduction in coccidial oocysts in excreta could lead to the development of new strategy for the prevention of avian coccidiosis.

Coated essential oil blend –protected for better performance:

Where essential oils are concerned, thymol and carvacrol are scientifically well-documented

compounds. Due to their phenolic structure (having a cyclic ring with a hydroxyl group attached) they are recognized as efficient compounds showing a variety of beneficial effects in the gut. NEXT ENHANCE® 150 (NE150) is a highly concentrated blend containing thymol and carvacrol protected by a unique coating. This





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

ensures that the active ingredients are stable during pelleting and can ultimately result in a controlled release to the lower parts of the intestinal tract.

Multi-faceted approach: Thymol and carvacrol are highly effective against a wide range of potential pathogens. In a variety of studies, NE150 has demonstrated its potential to establish a healthy microbial composition by promoting higher lactic acid-producing bacteria and reduce pathogenic species. An example of the antimicrobial effects in broilers is shown in **Figure 1**.

In the study, an *Eimeria* challenge model was used, which typically increases the levels of *C. perfringens*. It is well known that *C. perfringens* is the causative agent for necrotic enteritis but requires other predisposing factors to become clinical or subclinical. The invasion of intestinal cells by the *Eimeria* parasite is seen as the major predisposing factor because it creates tissue

damage and leakage of plasma proteins used by *C. perfringens*. Broilers, receiving NE150 showed lower levels of *C. perfringens* as well as lower levels of *Enterobacteriaceae*, a large family of pathogens including *E. Coli* or *Salmonella*. As a result, NE150 is shown to lower the risk of a bacterial overgrowth, which is key in the development of necrotic enteritis.

Biomarkers can be used to study the effect of protected thymol and carvacrol on intestinal integrity and gut barrier function. The stability of the tight junctions (a unique connection between cells), for example is linked to the amount of occludin, which increases the physical barrier function of the intestine. Under challenge conditions and during inflammation processes, occludin is known to be downregulated. A broiler study with *C. perfringens* challenge showed lower levels of occludin, which increased with the addition of NE150. This lowers the risk of pathogen translocation, or the

Figure 1: Reduction in caecal *C. perfringens* & *Enterobacteriaceae* 8 days post-challenge with *Eimeria*

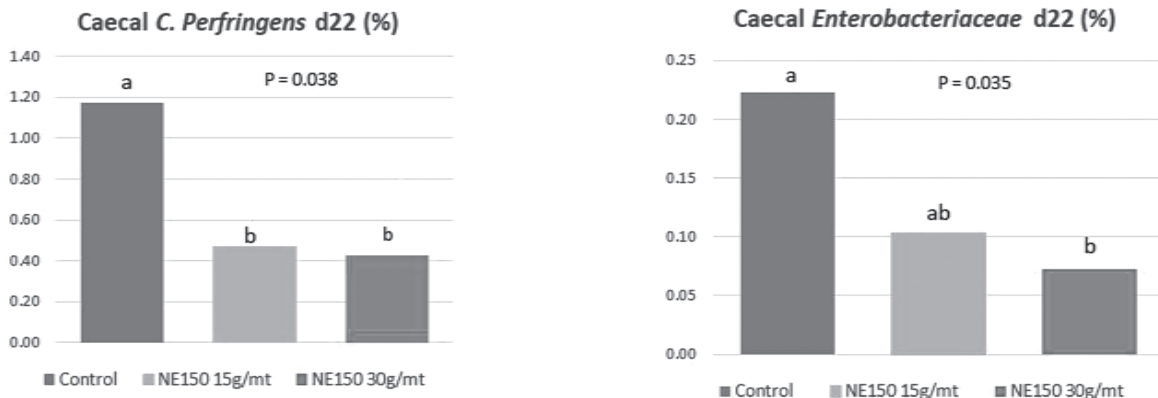
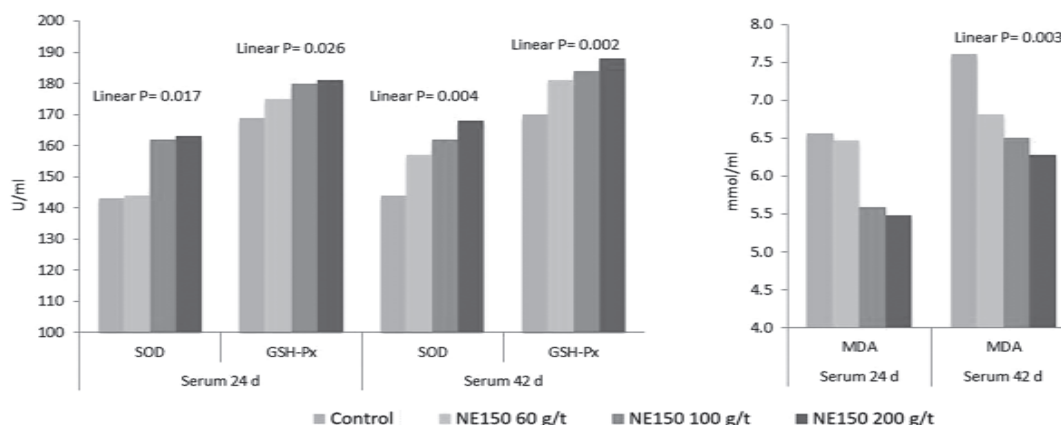


Figure 2: Improved antioxidant status



uncontrolled transfer of different molecules from the lumen into the bloodstream. It has also been shown that broilers receiving NE150 under *Eimeria* or *C. perfringens* challenges showed significantly lower serum endotoxin levels, indicating improved mucosal barrier integrity. Adding NE150 to the ration has also shown increased villus height to crypt depth ratio, another well recognized marker for intestinal health. Macroscopic intestinal lesions are another relevant indicator of gut health. In *Eimeria* and *C. perfringens* challenge studies, these lesions were significantly reduced with NE150. Fewer intestinal lesions can result in a lower inflammation processes and can directly translate to performance improvements.

During a host-pathogenic infection, pro-inflammatory cytokines are released to activate the immune system. However, the inflammation needs to be controlled as a prolonged and persistent activation of pro-inflammatory cytokines can result in mucosal damage as well as impact the stability of tight junctions. The inflammation also consumes a lot of energy, which impacts performance. NE150 is shown to downregulate pro-inflammatory cytokines, which helps to protect intestinal barrier function and save energy. Conclusively, thymol and carvacrol lower the risk of performance depression and intestinal damage caused by inflammation.

Thymol and carvacrol are also known to have anti-oxidative capacities due to their chemical structure. To understand how NE150 could benefit

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

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

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

References available upon request

PRESS RELEASE

Online Discussion Forum (ODF)–On Trends In Poultry Health, Season-2 Organised by CPDO & TI in Association with INFAH, On 16TH September 2021

Central Poultry Development Organization & Training Institute under Government of India, Ministry of Fisheries, Animal Husbandry & Dairying, a premier Institute located at Hessarghatta, Bengaluru organized a one day online Discussion forum – on **TRENDS IN POULTRY HEALTH, SEASON-2 ORGANISED BY CPDO&TI in association with Indian Federation of Animal Health Companies, on 16TH September , 2021**

Poultry sector in India is a techno-commercial sector with contribution of nearly 1.5 lakh crores to the GNP with about 6 million people being employed directly or indirectly. Poultry Farming Practices in India are one of the best in the world. The Science adopted in Genetics, Nutrition, Management and Disease prevention are one among the best in class matching Global Standards. Presently it is estimated that 4.5 billion broiler population, 250 - 300 million layers and about 3.5 to 4.0 crore broiler breeders are being reared in India. The health specialists have achieved huge task in disease prevention and health management in the country. However, poultry health is a dynamic, ever evolving entity among poultry farming. It is always required to get abreast with the latest knowledge and tips for poultry health management. Hence, this discussion forum is envisaged to outline the present trends in poultry health. Since poultry health is a vast subject, it has been envisaged to conduct in series wise as Season-1, followed by many.

This event was organized in association with Indian Federation of Animal Health Companies (INFAH) under the leadership of Mr. Vijay Teng, President and Dr. Vijay Makhija, General Secretary along with poultry expert members of INFAH.



The Online Discussion Forum started sharp at 10.30 am on 16th September 2021 by opening remarks from **Dr. Mahesh P.S.**, Joint Commissioner & Director, CPDO&TI. He briefed about the legacy of CPDO&TI being an organization built over six decades (1960). Dr. Mahesh appraise the delegates that speaker have joined from different parts of country & overseas as well. The online discussion forum is streamed on Zoom link & also on YouTube channel of CPDO&TI. The topics of the Online Discussion Forum focused on the Immunity, Data management & Traceability, Food Safety, One Health approach to tackle AMR.

Further he elaborated that digitalization, consumerism, focus on safe food and health would create more demand for protein foods like eggs and chicken in India with a priority preference for safe and certified traceable products. Hence, he advised to adopt latest software's for data collections in various poultry operations.

Dr. Vijay Makhija, General Secretary, INFAH, made a presentation from Mumbai, Maharashtra digitally about activities of the Organization which is formed in 2012. At present, it has 52 members representing



more than 85 percent of Animal Health Markets turnover in India. INFAH is celebrating its 10th anniversary this year & is one of the largest animal health organization across the globe. He mentioned about INFAH's motto being "**Healthy Animals, Healthier India**". INFAH is invited in all major decision making pertain to Animal health sector and is considered as a voice of Industry. INFAH has focused approach via sub committees on various aspects of health issues related to scientific research in veterinary field. This organization has set out guidelines and working in liaison with government in various committees. This online discussion forum is organized by members of Biologicals & Biosecurity sub-committee of INFAH.

Mr. Vijay Teng, President, INFAH in his inaugural address through online from Ahmedabad, Gujarat, appreciated the efforts of CPDO&TI organization under Government of India for conducting such innovative programmes through digital gateway. He



elaborated on changing preferences in food habits with more focus on protein foods like egg and chicken recipes. He assured to extend full cooperation and support to CPDO&TI for

conducting many more seasons under Poultry Health series.

Dr. Roel Mulder Secretary General of World Poultry Science Association (WPSA) joined online from Netherlands. He thanked INFAH for inviting him to this online discussion forum. He shared that WPSA is the "The leading global network for poultry science and technology". Its motto is Working together to feed the world. The WPSA is a long established (est. 1912) and unique organization that strives to advance knowledge and understanding of all aspects of poultry science and the poultry industry. Its mission is to facilitate sustainable and socially equitable poultry production worldwide by encouraging and liaising research scientists, educators and those working



in the many sectors of the industry. With a large and truly international membership of 8000, the organization's objectives are promoted in various ways. These range from high-profile international congresses and conferences to the many diverse meetings organized by WPSA national branches (of which there are about 80), two federations of branches, in Europe and in the Asia Pacific region and two networks, the African Poultry network and the Mediterranean Poultry network. The World's Poultry Science Journal, the official organ of the WPSA, has developed a highly international reputation for its content, which covers virtually all aspects of production and science in the poultry industry. He shared Co-operation with other associations and organizations & is looking forward to explore collaboration with INFAH



1. Dr. Jayaraman K Poultry Expert joined from Coimbatore spoke on the topic “**Immunity Simplified**”. In his presentation he elaborated in detail about the concept of Immunity development post vaccination. He emphasized the significance of strong gut health. In addition he shared practical experiences with regards to basics of immunity, how to device optimal vaccination schedule ,understanding vaccination failures & tips for better immunization . His key take home messages were , Understand basics to device good schedule and understand failures , Combined approach of correct spacing , combination of live, killed and supported by immune modulator gives good result ,latest technology vaccines are good but world of caution ,use with judicial schedule and health status ,take note of variants and emerging disease , don't plan for best immunity , but plan for optimal immunity . It come with cost. His detailed presentation can be viewed through CPDO&TI YouTube channel: **CPDO & TI TRAINING**

Dr. Ajay Deshpande, Poultry Entrepreneur presented online from Pune, Maharashtra about the topic Data Management & traceability. In his address he narrated simple practical elements of



importance of data management and traceability for efficiency enhancement. His key take home messages were : Poultry industry over the years has evolved into a modern state, the traditional farming systems without proper data keeping, data analysis and traceability doesn't exist now a days, the organization can't grow without having its data system in place, Livestock farmers, feed mills, slaughterhouses, hatcheries and all departments of a poultry company are becoming more and more adept at capturing data, True value is generated from the information that can be obtained from the analysis of these data. When data is in its place, the quality of your decisions improve drastically. By nature, people have different ways of processing information, but a centralized system ensures a framework to plan, organize and delegate, If your organization is looking to stay ahead of the curve, it requires a good data maintenance system in place.

Dr. Javeed Mulani, working with OSI Vista Processed Foods Pvt. Ltd. joined online from Coimbatore Tamandu . He addressed on the topic “**Food Safety in Chicken Meat Production**” & gave overview of Food Safety in Indian Poultry, Food Safety Hazards in Chicken Meat, Transparency



Requirement in Poultry Supply Chain, Food Safety Key Considerations at Broiler Farm , Critical to Quality and Safety Points at Poultry Processing Plan & Role of Government Agency. His key take away messages were as follows:

- **Innovative Farm Best Practices:** follow new innovative best practices to ensure food safety

at each stage of Poultry supply chain and make sustainable poultry farming.

- **Modern Poultry Processing Plant:** Growing demand of safe and good quality chicken meat processed at HACCP base modern poultry processing plant.
- **Traceability:** It increase transparency in poultry supply chain and increase confidence about safety of chicken meat.
- **Guideline for Wet Market:** Formalize regulation/guideline to improve GMP practices in wet market which contribute >90% in Indian poultry Industry.
- **International std and FSSAI regulation:** Follow stringent international standards & FSSAI food safety regulation to lead in world.
- **Consumer awareness:** Increase awareness about safe and good quality of chicken meat and increase the consumption of chicken meat in country.

Question and Answers with the speakers was conducted by Dr. Vijay Makhija. The details can be accessed through Youtube / Facebook link of CPDO&TI and LinkedIn of INFAH.

The final session of the day was Panel Discussion with three regulatory & technical personnel's namely, **Dr. D.J. Kalita, Dr N. C . Prakash Reddy**



Dr. D.J. Kalita



Mr. Ritesh Patel

and Mr. Ritesh Patel of INFAH Biological & Biosecurity sub-committee. They shared insights on One Health approach to tackle AMR, role of vaccines, Biosecurity & Diagnostic to address AMR & key initiatives of INFAH with regards to addressing the issues of AMR. Elements of National Action Plan on AMR were discussed in brief. INFAH promotes judicious & prudent use of antimicrobials & impart continuous education on following the withdrawal periods.

Dr. Mahesh P.S., Joint Commissioner & Director, CPDO&TI mentioned that Team CPDO&TI would conduct many such programmes in the coming months. The programme was conducted live on zoom, YouTube channel of CPDO&TI along with recordings posted on Facebook: cpdoti.Bangalore, on youtube: CPDO&TI TRAINING and LinkedIn of INFAH. All are requested to download "Latest App of CPDO&TI" from Google Playstore by typing "CPDO&TI" for Android Version.

Sri. S.M. Anwar Basha, Senior faculty of CPDO&TI executed the job of Admin of conducting Discussion Forum very effectively and proposed vote of thanks for the delegates. The other team members of CPDO&TI worked hard in making this programme successful. Team CPDO&TI thank all the viewers participated through Zoom and Youtube. It is also acknowledged that Print Media extends great support by wide coverage of all online events of CPDO&TI across the country.



CPDO&TI ONLINE DISCUSSION FORUM

"TRENDS IN POULTRY HEALTH, SEASON-2"
THURSDAY | 16TH SEPTEMBER | 2021



ORGANISER: DR. MAHESH PS
Joint Commissioner GCI & Director



CO-ORGANISER: DR. VIJAY MAKHLAJ
General Secretary, INFAH



INAUGURAL ADDRESS: MR. VIJAY TENG
President, INFAH



SPECIAL INVITEE: DR. ROEL MULDER
Secretary General, WPSA



DR. JAYARAMAN K
Poultry Expert, "Immunity Simplified"



DR. AJAY DESHPANDE
Poultry Expert, "Data Management & Traceability"



DR. JAVEED NULANI
Poultry Expert, "Food Safety in Chicken & Egg"



DR. D.J. KALITA
Panelist, INFAH



DR. N.C. PRAKASH REDDY
Panelist, INFAH



MR. RITESH R PATEL
Panelist, INFAH

Free Lance Poultry Consultant

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



His areas of expertise include:

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

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

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Standardization of botanical powders starts at the grassroots

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

Natural Remedies is the number 1 veterinary herbal healthcare company in India with presence in more than 30 countries across the globe. Through its world-class Research and Development centre, Natural Remedies offers a category of science-based Phytogetic feed additives, called Standardised Botanical Powders (SBPs). In this series of articles, Dr. Raina Raj, Head of Marketing at Natural Remedies, provides in-depth knowledge of what SBPs are, and their benefits in the poultry diet.

The organic revolution in the food industry has taken the world in its stride. The consumer awareness of the health benefits of natural products shall keep this revolution going. There has been tremendous growth in the global organic animal food industry. The global organic poultry market alone is expected to make \$7.67 billion in 2021. Although there have been several discussions to



Dr Raina Raj

meet the desired market demand, there is little talk around the quality and consistency of natural products. With this in mind, we have designed this series of articles, which sheds light on the importance of standardization in botanical powders. In the last two issues, we have discussed with evidence what standardized botanical powders (SBPs) are, and how an SBP comes into being.

The medicinal property of a plant is determined by the natural phytoactive chemicals they possess. Phytochemicals, such as alkaloids, terpenes, phenolic compounds, and flavonoids are encapsulated by a specialized membrane known as tonoplast. A tonoplast is a semipermeable membrane surrounding a vacuole in a plant cell. Once the SBP is fed to the animal, the tonoplast disintegrates in the gut of the animals, releasing the phytochemicals. These phytoconstituents have been reported to exhibit various biological effects for instance adaptogenic, hypoglycaemic, antioxidant, immunomodulatory, anti-inflammatory, anti-cancer, and gut enhancing properties. However, the biosynthesis of phytochemicals is significantly affected by several factors such as environmental

stress conditions like seasonal changes, geographical location, plant maturity, soil type, farming practices, genetic make-up, and post-harvest processing to mention a few.

In India, manufacturers can purchase crude botanicals from local Bazaar, where 52% of their stock comes from temperate and tropical forests, 25% from wild-grown regions, and 20% from farms or plantations. Scientifically,

harvesting botanicals from wild sources not only damages the biodiversity of the region but also there is no accountability to the variation in their phytochemical constituents, which poses an issue when botanical compounds need to be standardized. Therefore, it is important to ensure that plants selected for their medicinal uses contain relatively fewer variations in phytochemical constituents. Standardization is essential to maintain consistency in the biological outcome when consumed by animals. Hence to overcome these issues the standardization process begins at the farm where the medicinal plants are cultivated under supervision and can be harvested at the optimum time of growth for the best utility of the phytochemicals.

Contracted supervised farming

One of the strategies to procure superior quality raw botanicals with the least variability in their phytoconstituents is through contracted supervised farming. This helps monitoring of the raw product for its authenticity, safety, and least variability in the desired phytochemical; ensuring organic methodology is used in the plant cultivation process; harvesting at the specific age of maturity, when the

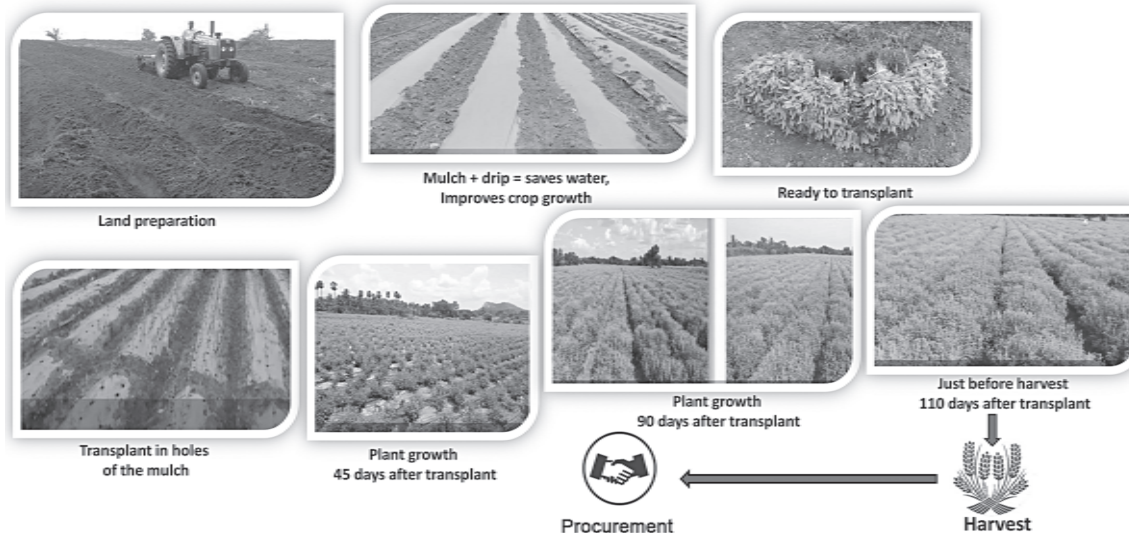


Figure 1: Farmers receive support and guidance from land preparation until the time of harvest

phytochemicals are at their peak; to the farming community this generates a steady source of income; this generates gainful employment in rural communities; they receive support and guidance throughout the cultivation process; they receive input after analysis of the soil and water samples for pH, conductivity, organic carbon, phosphorus, potash, and residual pesticides. Since the plants are grown organically, pesticide use is avoided, which in turn helps the environment. However, to ensure that the crops receive sufficient nutrients the manure used as fertilizer is also assessed, for physical and chemical properties such as colour/odour, moisture percentage, pH, conductivity, organic carbon, N-P-

K, CN ratio, micronutrients like Fe, Mn, Zn, etc. A technical team supervises the land for soil waterlogging, major weed infestation, and irrigation and assists the farmers to solve any issues in the field. In general, it is a win-win situation for both the contracting herbal company and the farmer.

Assessment of authenticity

The herb samples collected from the farm should be evaluated extensively for their genuineness at the physical, microscopic, and molecular levels (Figure1).The authenticity of the herbs is already established at the seed level during collection.Ultimately, all these assessments are

	Fresh plant	Dried root	Fresh fruits	Dried fruits
<i>Withania somnifera</i>	Macroscopic			
	Microscopic			
	TLC			
<i>Phyllanthus emblica</i>	Macroscopic			
	Microscopic			
	TLC			

Figure 2: Herbal authentication

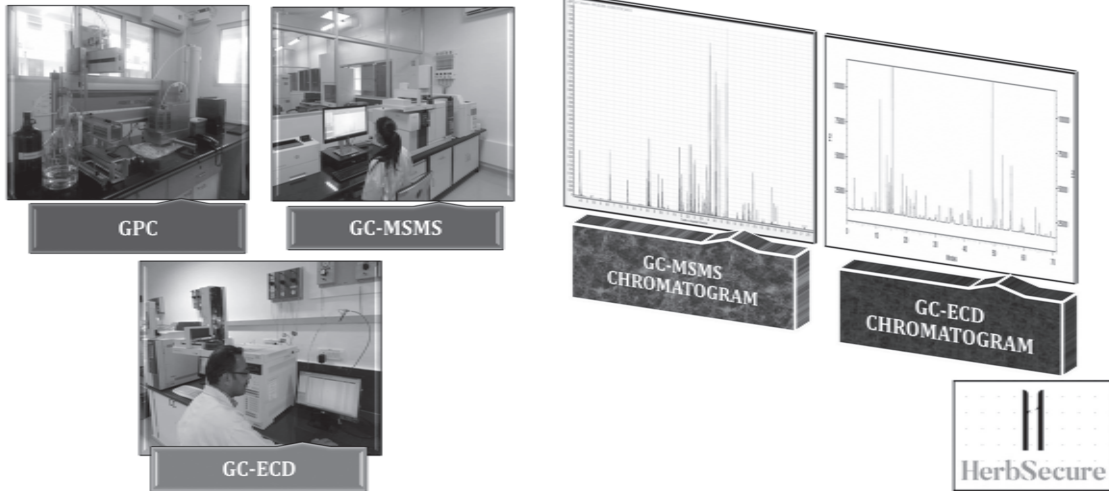


Figure 3: Pesticide Residues in the raw material are evaluated by GC-MSMS/GC-ECD

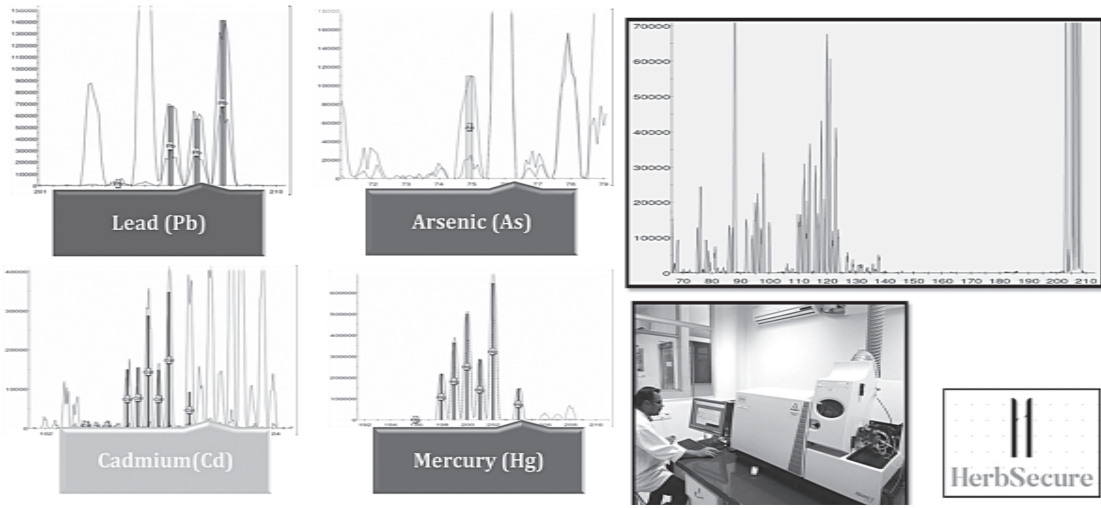


Figure 4: Heavy metals in the raw material are detected by ICP-MS

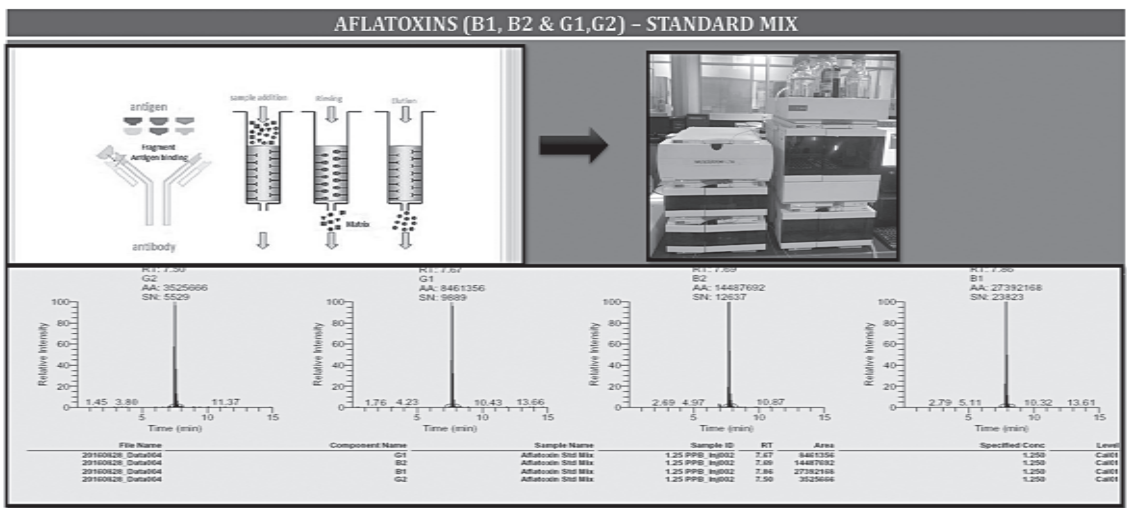


Figure 5: Aflatoxins in the raw material can be detected through HPLC-FLD

Authentication certificate (Passport Data)	
	
1) Genus	<input type="checkbox"/> <i>Ocimum sanctum</i> L.
2) Species	<input type="checkbox"/> <i>sanctum</i>
3) Author	<input type="checkbox"/> Linnaeus
4) Family	<input type="checkbox"/> Lamiaceae
5) Synonym	<input type="checkbox"/> <i>Origanum sanctum</i> L.
6) Common name (as prevailing in the area collected)	<input type="checkbox"/> Sacred basil(E), Tulsi (H), (T), (S)
7) Flavour part(s) collected	<input type="checkbox"/> Leaf/total part
8) Describe the habitat include associated species, soils, rain/fall, pollinators, predators	<input type="checkbox"/> Agricultural land, red soil, 1000 - 1200mm rainfall. Associated species: <i>Eleusine peruvica</i> , <i>Azadirachta indica</i> , <i>Sida acuta</i> var. <i>butter</i> fls, dragon fls, honey bees, ants, lings etc.
9) Describe the plant you sampled as you see it today (flower color, fruit color, growth form, DBH, height, bark color and texture, slash, latex, other)	<input type="checkbox"/> Cultivated in order to get young trips which are used to make galenic, which are used in temples during puja. Aromatic Herb, about 45-60cm tall, leaves simple, opposite, petiole 0.5-1.0 cm long, ovate, margin serrate, apex obtuse, pubescence with sparse and glandular midrib; herbaceous, veins in colour from purple to green. Stems in terminal branched racemes. Flowers 1-3 together in verticillate cymes bilipped, upper large, greenish, corolla pinkish to white, bilobed, exserted, tubular, array 4 lobed, style long. Stamens 4 outside brownish
10) Quantity collected	<input type="checkbox"/> kg
11) Material collected (tick appropriate box)	<input checked="" type="checkbox"/> Single plant <input type="checkbox"/> Multiple plants
12) Place(s) of collection	
Place: _____ District: _____ State: _____	
13) GPS data	
Latitude: _____ Longitude: _____ Altitude: _____	
14) Time of Collection	Date: 04/1/2020 Time: 8:00am
15) Approximate age of the plant (at the time of collection)	<input type="checkbox"/> 3 months
16) Collected from (tick appropriate box)	<input checked="" type="checkbox"/> Cultivated land <input type="checkbox"/> Wild
17) Mode of drying (please tick the appropriate)	<input checked="" type="checkbox"/> Sun dry <input type="checkbox"/> Shade dry <input type="checkbox"/> Any other
18) Batch No./voucher (Herbarium)	<input type="checkbox"/> 1028
19) Traditional Use	<input type="checkbox"/> Seeds made from stem wood is used to make galenic, leaf oil is a perfume, leaf juice is used to cure cough, herb is considered sacred and grows in farms of Hindus.
20) Collector's name	<input type="checkbox"/> Dr. F. Sandhan Ph.D (Bot) - In house Taxonomist
21) Determined by Date Sign	<input type="checkbox"/> Dr. F. Sandhan Ph.D (Bot) - In house Taxonomist 30/01/2020

Figure 6: Passport data of *Ocimum*, authenticated by a botanist.



Figure 7: Post-harvest the raw material is labelled so that its origin can be traced back

necessary for the standardization process of the SBPs and to provide consistency in each batch to give the desired biological effect.

Assuring safety

To ensure the SBPs are safe, the herbs are collected from a pristine area where there is no heavy presence of contaminants. Also, the safety is ensured with the

harvested raw herbs through testing for pesticides, heavy metals, and mycotoxins/aflatoxin. The samples can be tested for pesticide residues with Gas Chromatography – Electron Capture Detector (GC-ECD) and Gas Chromatography-Tandem Mass Spectrometry (GC-MS/MS) as shown in Figure 3. Heavy metals such as Cadmium, Arsenic, Lead, and Mercury are evaluated with an inductively coupled plasma mass spectrophotometer (ICP-MS) as shown in Figure 4. Heavy metal, pesticides and mycotoxins occurrences in herbs, if not maintained below safe levels can lead to life-threatening toxicity in animals. Aflatoxin and mycotoxins are detected using high-performance liquid chromatography with fluorescence detection (HPLC-FLD) as shown in Figure 5.

Traceability of the raw material to its origin

The whole process of cultivation to harvest should be well documented, just as travel information in a passport Figure 6. Supervised farming helps maintain scientific recording that gives details at each stage of growth, if at all there are any untoward variations noticed in the performance of the product, it can be traced back and re-evaluated with scientific data. Post-harvest the product should be well labelled too (Figure 7). So that finished goods can be traced to which farm they originated from. The whole raw material procurement process becomes more science-based which helps in the standardization of SBPs and is eco-friendly, by maintaining the biodiversity of the forests, avoiding pesticides, and ensuring customers a safe end product free of synthetic constituents.

The current article emphasizes the importance of procurement of high-quality raw material by focusing on its authenticity, safety, and documentation to keep good consistency in the concentration of the phytoconstituents. Finally, these would result in high-quality SBPs. In our next issue, we shall elaborate on the “Check, Assessment, and Revalidation of SBPs.”

Respiratory challenges in poultry during humid conditions-an overview and solution

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

Natural is future 2.0 is a webinar series powered by Natural Remedies Pvt. Ltd., where we invite eminent speakers from across the globe to share their thoughts on the most relevant topics in the animal health industry. In August, we had the privilege of hosting two



Dr. Sudheer Rukadikar

speakers, Dr. Sudheer B. Rukadikar, veterinary pathologist and poultry health consultant, and Dr. Chandan Chatterjee, Group Product Manager at Natural Remedies Pvt. Ltd. The focus of their discussion was towards understanding and providing practical solutions to the respiratory challenges in poultry, faced during high humidity conditions.

Dr. Rukadikar started his talk by pointing out the increased incidence of respiratory diseases worldwide in recent days due to the intensive rearing methods followed. He has used the term respiratory disease complex (RDC) as acute respiratory diseases caused due to several etiologies characterized by respiratory distress, depression, and increased mortality in poultry.

Dr. Rukadikar mentioned that each year, India faces losses of millions of rupees due to poultry sickness caused by viruses, bacteria, and fungi. Microbial illnesses in poultry are a huge concern, despite the widespread use of antibiotics and the best vaccinations available. The large bioburden is one of the explanations. Bioburden is the presence of disease-causing organisms in the shed, which are passed down from one flock to the next.



Dr Raina Raj

Dr. Rukadikar brought to notice that there has been growing concern about the presence of residual antibiotics in poultry meat in recent years. This puts pressure on poultry rearing practices to limit antibiotic use in poultry to therapeutic

rather than prophylactic or growth-enhancing purposes. Also, the emergence of new multi-drug resistant (MDR) bacteria is a reason why we must use antibiotics at the lowest levels possible.

Clinical symptoms of RDC in chickens are sneezing; open mouth breathing; head shaking; ruffled feathers; gurgling breathing sounds; discharge from nostrils and eyes; eye swelling.

Why is the poultry respiratory system more susceptible to infections as compared to mammals?

While discussing the anatomy and physiology of the chicken respiratory system, Dr. Rukadikar pointed out that, unlike mammals, the chicken respiratory system is not limited to the thorax but extends throughout the body. As a result, maintaining the integrity of the system is crucial. The invasion of the respiratory tract influences the overall performance of the birds. Nostrils, trachea, and bronchi form the upper respiratory tract (URT). The lower respiratory tract is made up of the lungs and air sacs (LRT). The URT also acts as the first line of defense in the body, preventing pathogens from entering. **Air sacs** are very thin-walled expansions of the bronchi that are only seen in avian species. They are found all over the bird's body,

and they create **pneumatic bones** when linked to long bones. Any damage or infection to the air sac can cause the bones to get infected. **The cleft in the hard palate** is another unusual aspect of the bird's anatomy.

The respiratory system is also a part of the immune system.

Putting the immune system in the spotlight Dr. Rukadikar explained that the avian immune system is comprised of various branches, including gut immunity linked with gut-associated lymphoid tissue (GALT) and respiratory immunity related to bronchial associated lymphoid tissue (BALT). The BALT works by eliminating inhaled particles and keeping the airways clean, preventing or inhibiting the entry of disease-causing pathogens from the air. Several supplements can be used to promote BALT function and immunity by strengthening the respiratory tract's immunity and defending the body against disease-causing germs.

Challenges in the monsoon season

Birds can withstand relative humidity (RH) levels of 50-70 percent. However, due to increased air humidity during the monsoon season, **dampness** in the shed is high. Higher humidity always adds pressure to the respiratory system and birds cannot breathe properly.

Ventilation: Poultry houses should be well ventilated. Sufficient aeration is necessary to eliminate dangerous gases such as ammonia, carbon dioxide, and carbon monoxide from the shed. Gases such as ammonia accumulation can lead to damage to the ciliated epithelium in the trachea, which is known as the first line of defense in the respiratory system. When ammonia levels reach 25 ppm, it will lead to **ciliostasis**, where cilia stop moving, and at levels of 40 ppm, it leads to **de-ciliation**, which is the loss of cilia. Weakening of the first line of defense will lead to the entry of

pathogenic organisms into the LRT, causing serious diseases. Hence, it is important to keep ammonia at the lowest level with proper ventilation. Dr. Rukadikar provided evidence through autopsy images showing disease changes noticed, to emphasize the damage caused.

Filthy litter: About 80 percent of the water consumed by birds is added back to the barn through respiration and excreted as faeces. Due to high humidity, the litter may not dry quickly; care must be taken to remove caked litter.

Vaccination Reactions: Dr. Rukadikar mentioned that vaccinations have, without any doubt, contributed significantly to the health and welfare of birds in poultry farming. But live virus vaccines can sometimes lead to vaccine reactions. Certain vaccine viruses replicate in the intestinal (Newcastle disease (ND), infectious bronchitis (IB), and IBD vaccine viruses) and/or respiratory tract (ND and IB vaccine viruses). But due to replication in the respiratory tract, ND and IB vaccines provoke respiratory distress. In combination, ammonia build-up with poor ventilation in the shed leads to a weakened respiratory immune system. Hence, efforts must be made towards avoiding vaccine reactions too.

Bringing the focus on the current known **respiratory diseases** in chickens, Dr. Rukadikar listed infectious coryza, infectious laryngotracheitis, IB, ND, avian influenza (AI), and chronic respiratory diseases, which are primarily diseases of the respiratory system. But diseases, such as fowl cholera, aspergillosis, and fowl pox (diphtheritic form), may also affect the respiratory organs.

He then explained the **strategy** to be followed to overcome respiratory distress.

- Firstly, one must target **improving respiratory immunity**, aiming at keeping airways patent and reducing stress on the respiratory system.

- Secondly, one should try to increase hemoglobin levels in birds so that oxygen-carrying efficiency is improved.
- During the high-risk period, such as the monsoon season, one should use products that can remove excess mucus in the bronchi such as bronchodilators and expectorants.

General principles to be followed to prevent RDC:

- Cleaning and disinfection of the poultry shed between flocks to reduce bioburden.
- Avoid immunosuppression in birds.
- Continuous disinfection by spraying.
- Keeping the shed aerated, dust-free and the birds stress-free.
- **As prevention of RDC**, one can use herbal products that act as expectorants and bronchodilators; expand the capacity of the lungs to ease respiratory distress.

Dr. Chandan Chatterjee, group product manager at Natural Remedies Pvt. Ltd., took over the session and talked about a natural way to boost the natural immunity of the respiratory system. He put forth the concept of positively modulating immunity by enhancing immunity and negative modulation by reducing inflammation.

He introduced the product **Respease™** which is an herbal liquid consisting of Glycyrrhizin, Vasicine, Rosmarinic acid, and the essential oil Carvone. **Respease™ improves respiratory immunity and boosts oxygenation of the cells** through its hematinic activity and respiratory soothing effect.

He showed histopathological slides with evidence of **increased BALT area** in chicken lungs after supplementation with Respease™. The **anti-inflammatory** property of Respease™ was tested for its effect on COX2 and PGE2 inhibition. Both

COX2 and PGE2 are inflammatory mediators. Respease™ also exhibits properties of a mucolytic, expectorant, bronchodilator, anti-oxidant, and anti-spasmodic. Supplementation with Respease™ in a field trial consisting of 30,000 broiler birds showed improved FCR, increased body weight gain, lower mortality, and improved bird activity as compared to the untreated control group. Respease™ has been extensively assessed and has scientific backing for its ability to improve respiratory immunity and attenuate respiratory distress. The questions addressed during the session are below:

How do we take care of respiratory challenges in layers? Is week-a-month antibiotic therapy sufficient?

Dr. Rukadikar: With the growing concern about the residual antibiotics in chicken meat, it is not advisable to follow the week-a-month schedule of antibiotics for prophylactic purposes. Management tools such as clean environment, stress-free, dust-free, good ventilation, and clean sheds. Also, when going for the live IB and ND vaccines, farmers should supplement the birds with products that minimize stress on the respiratory tract to avoid vaccine reactions.

Any change in the vaccination schedule required to control respiratory infections?

Dr. Rukadikar: There is documentation that administering a live LaSota vaccine in the presence of avian influenza (AI) can lead to respiratory reactions. Hence, it is better to go for clone vaccines which do not show vaccine reactions.

Can Respease™ be used in treatment also?

Dr. Chandan: Respease™ has been designed to be used for prophylactic purposes, but it can also be used for treatment purposes.

What kind of management improvisations helps in reducing respiratory challenges in humid conditions?

Dr. Rukadikar: Avoid overcrowding.

If humidity is high and no natural air movement is present in the shed, then fix high-speed fans to help air circulation.

Does Respease™ react with any other medicine or supplements when added to water?

Dr. Chandan: Respease™ is a very inert herbal product and it is a natural product. Hence, it doesn't react with other medicines or supplements. It is very safe to add to water.

Even though a bird's respiratory system is advanced in comparison to that of humans and very effective, it is more prone to respiratory infection. Why?

Dr. Rukadikar: The avian respiratory system is advanced, but also delicate. The bird's respiratory system is not restricted to one part of the body. It is spread throughout the body and any minor insult to any part of the system will spread all over.

CRD is a common problem in the field. How can we manage the situation?

Dr. Rukadikar: a. CRD is vertically transmitted from parents to offspring, hence purchasing the chicks from a known vendor where the parents are not infected.

b. Preventive Treatment: Tylosin and Tilmicosin can be used according to the prescribed dosage.

c. If there is a doubt about mycoplasma infection, then the flock must be vaccinated for IB and ND at a young age. In spray vaccination, the size of the vaccine must be very critically managed.

What is the main point of cleaning with disinfection to protect against respiratory problems?

Dr. Rukadikar: Cleaning must be done well before introducing a new flock. This is not just for the prevention of respiratory diseases, but also for other diseases. Cleaning should be done well with no residues of organic matter. This should reduce the bioburden to a great extent. And disinfection with the recommended concentration has a good effect.

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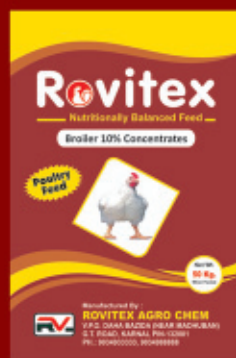
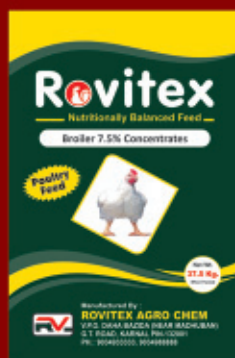
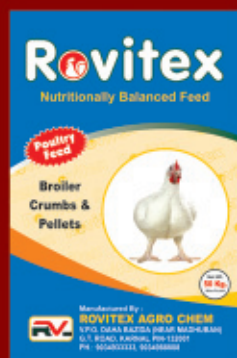
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Managing the Rising Price of Agricultural Commodities

Commodities prices are rising around the world, and many producers are trying to manage by using alternative crops or cutting quality standards. But does it put animals—and, ultimately, operations—at risk? Here is what you need to know.

by Augusto Heck

In Brief

- When the prices of agricultural commodities rise, some producers lower quality standards to save costs or buy alternative ingredients.
- Lower quality and alternative grains can have consequences in animals. The costs of managing those consequences could negate the savings achieved by buying cheaper grain.
- Understanding and mitigating risks, including likelihood of mycotoxin contamination, is key to profitability.



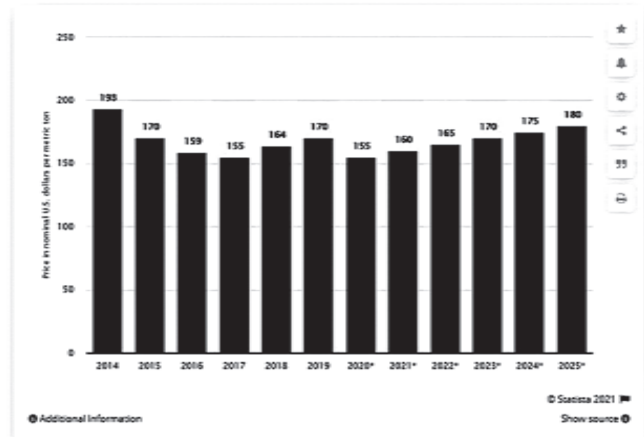
Photo: Timothy Jenkins

The price of corn and soybeans, two of the main commodities used in feed formulas, **has been skyrocketing**. Repercussions have been felt worldwide, with increases in production costs resulting in the narrowing of profit margins or, sometimes, producers operating at a loss.

Corn, for example, is a basic ingredient in diets. The average international price is around USD 160 per ton, and projected to rise in USD 5 increments to an incredible USD 180 per ton in 2025.

To mitigate this economic impact, many production systems have adopted risky strategies, namely

relaxing their quality standards for the purchase of corn, compromising on standards such as moisture levels, percentage of damaged grains, oil content and **mycotoxin contamination**. When purchasing soy, the protein, moisture and crude fiber content—as well as the urea activity and presence and levels of mycotoxins—have been made more “flexible”.



Average Worldwide Price for Maize

Source: Statista

Consequences of using lower quality commodities

The consequences resulting from this “flexibility” of quality standards include:

- the need for nutritional correction with aggregation of extra costs sometimes equal to or greater than the resource savings generated in the purchase of lower quality the grain;
- higher presence of anti-nutritional factors that negatively impact zootechnical indicators;
- greater prevalence and levels of mycotoxins and with a strong possibility of co-contamination, generating the need to invest

in products to mitigate the impact or, if they are not adopted, face mycotoxicosis in animals. Because of the compounding effects of co-contamination with multiple mycotoxins, the impact of mycotoxicosis could be orders of magnitude greater than the initial contamination levels.



The moisture content of corn, when high and occurring along with hot temperatures, creates ideal conditions for the proliferation of fungi and, potentially, the production of mycotoxins. Damaged grains are more vulnerable to these fungi because they have lost their protective structures. The oil content, associated with the energy level that the corn must contain, may be significantly reduced in poor quality grains, generating the need for nutritional corrections. And when mycotoxins are present at certain levels, their effects range from silent and delayed damage to the health and performance of your animals to large losses resulting from severe disease called mycotoxicosis.

Soy primarily contributes to the protein fraction in diets. When we have low quality soy, the protein content tends to be lower, requiring nutritional corrections. The high moisture content, together with high temperatures, can also encourage fungal growth and the production of mycotoxins. If the urea activity is high, it means that the thermal processes of inactivation of anti-nutritional factors present in the soybeans were not well executed and could have a negative impact on performance. As with

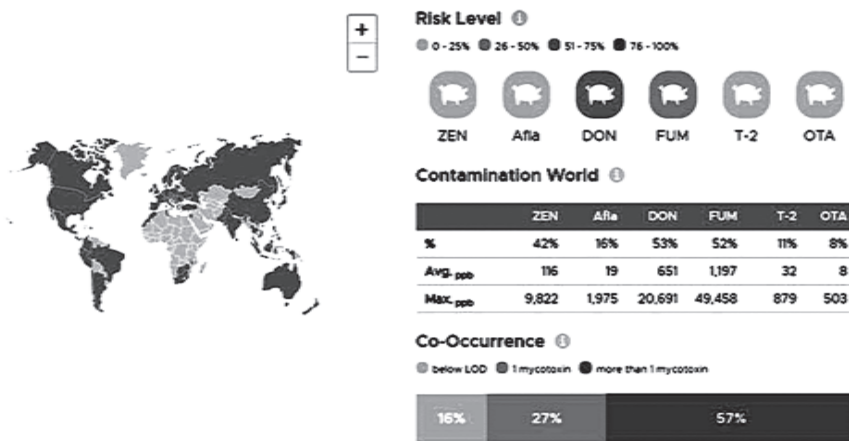
corn, soy can be a source of mycotoxins and so must be tested.

When mycotoxins are present at certain levels, their effects range from silent and delayed damage to the health and performance of your animals to large losses from mycotoxicosis.

The proportion of systems that have incurred these risks is quite high, given the scarcity of supply and the steady, if not increased, demand, as well as increased opportunities for international trade arising from the sanitary crises in Asia and Europe, which had a negative impact on local production. The increase in production for export ends up aggravating the mismatch between supply and demand for commodities.

In addition, reducing minimum quality standards, some producers look for alternative ingredients to partially replace corn and soybeans. The ingredients vary depending on the place and times season. While there is information available on how to properly formulate feed from a nutritional point of view, there is a lack of information about the types of levels of mycotoxins they contain because they are not routinely monitored. The great vulnerability is the poverty of information regarding the types and levels of mycotoxins present in them, but now they need to be included in mycotoxin risk management programs.

In the **BIOMIN Mycotoxin Survey**, the longest running and most comprehensive data set on mycotoxin occurrence, samples from nearly all continents contained mycotoxins produced by fungi of the *fusarium* genus in quantities indicating a 'high risk' status. This apparent higher risk of mycotoxins may be partially justified by this pressure exerted by their price, but also by a growing concern with monitoring the quality of raw materials, generating more diagnostic information for decision-making. In this context fumonisin (FUM), deoxynivalenol (DON) and **zearalenone** (ZEN) are the mycotoxins most present in positivity and levels founded in most situations, comparing the same period with the previous year, we had an increase in risk levels.



Source: BIOMIN Mycotoxin Survey, January-June 2021

presence of two or more mycotoxins. This is particularly critical in the following combinations: FUM + DON and DON + ZEN. These combinations are said to be synergistic, that is, one mycotoxin amplifies the impact of the other. The presence of DON increases the absorption of FUM and ZEN, that is, the levels considered safe for all of them is lowered when there is co-occurrence.

Various Mycotoxins and their Effects

Fumonisin can cause pulmonary edema, nephrotoxicity and hepatotoxicity. What's more deleterious, and often the cause-and-effect relationship is not perceived, is its impact on the exacerbation of bacterial respiratory and enteric diseases, as well as immunization failures due to its immunosuppressive effect. These situations occur in the presence of low but constant levels of fumonisin. This is precisely what we are currently facing.

Trichothecenes, which is a group of mycotoxins that includes deoxynivalenol or vomitoxin, are characterized by causing digestive disorders, reduced weight gain, hemorrhages (e.g., stomach, heart, intestine, lung, bladder, kidney), edema, oral injuries, dermatitis, blood diseases, infertility, bone marrow degeneration, slow growth, immune suppression. Trichothecenes disrupt the barrier function of the intestine, allowing substances and disease agents to enter the animal's body, causing disease and loss of performance. Bacteria that causes enteric conditions have their pathogenicity increased in the presence of trichothecenes.

Zearalenone is a mycotoxin that has its chemical structure very similar to estrogen, which is the female sex hormone. This is the mycotoxin that worries all production systems that have breeding stock due to the negative impact that it can cause even in short-term situations.

The BIOMIN Mycotoxin Survey found that 65% of samples have co-contamination, that is, the

Starting from the premise that the possibility of the occurrence of mycotoxins and the levels found in the feed ingredients are high and the poultry is the species most susceptible to damage from them, it is essential to **test for mycotoxins, perform a cost-benefit analysis of mycotoxin risk management** and establish or reinforce mitigating actions.

Due to the biochemical nature of these three mycotoxins that we highlight as the most relevant, biotransformation is the mechanism of choice for a product to counteract mycotoxins. Other mechanisms are less effective, and efficacy is imperative at a time of high challenge.

BIOMIN Solutions

- The **Mycofix®** range products the appropriate components to convert FUM, DON and ZEN into harmless metabolites in a selective and irreversible way. The enzyme **FUMzyme®** hydrolyzes fumonisin. The bacteria **Biomin® BBSH® 797** produces an epoxidase enzyme that inactivates trichothecenes, the group of mycotoxins that includes DON, and last but not least, the recently launched enzyme **ZENzyme®** acts on zearalenone protecting the breeding stock.
- These components are the only ones approved for the reduction of food contamination with mycotoxins in the European economic community. Within the EU, only registered components can make statements about the deactivation of mycotoxins, and the EU seal indicates the effectiveness of these tools.



Suguna Feeds launches Cattle feed at affordable price



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

Mumbai, 20thSeptember 2021: Suguna Feeds launched their cattle feed variants- MilkyBest+ and NutriBest at their feed mill in Ganapathipalayam, Udumalpet.

economic factors and spreading awareness among the farmers.

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

About Suguna Foods:

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

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

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

Ferry Monné joins Aviagen India as Head of Sales and Marketing

Sept. 24, 2021 – Udumalpet, India. – In an ongoing effort to strengthen service to customers and drive the growth of the increasingly popular Ross® 308 AP broiler breeder, Aviagen® India has appointed Ferry Monné as Head of Sales and Marketing, effective Sept. 1. Ferry will report to Marc Scott, Aviagen India Business Manager.

Background of industry, business development expertise

A sales professional, Ferry joins Aviagen with a proven track record and a wealth of senior sales and sales operations experience in the poultry, automotive and IT industries.

Prior to joining Aviagen India, he partnered with a poultry equipment distributor in southeast Asia. Before that, he served as Business Development Manager, Asia and Oceania, for HATO Agricultural Lighting, where he successfully built up new markets, improved dealer performance and raised awareness of poultry-specific lighting equipment and technology. Originally from the Netherlands, he has spent the past 17 years working in India and Southeast Asia.

Welcoming him to the Aviagen India family, Marc said, “We are delighted to have Ferry on board, leading our drive to enhance the success of our valued customers and grow our business. He joins at a very exciting time for the India poultry industry – a time of rapid advancement, and Ferry and his sales team will be at the forefront, promoting the best breed and best practices to benefit all our customers.”

“I am passionate about teamwork, serving customers and striving daily to implement continuous improvement for their benefit. I look forward to joining



Ferry Monné

Aviagen India and working with my team to promote the health, welfare and performance of our customers’ birds and further improving the bottom line of their businesses,” added Ferry.

About Aviagen

Since 1923, Aviagen® has been a preferred global poultry breeding company with a mission to help its customers -- the world’s chicken meat producers -- supply sustainable, affordable and

nutritious protein to their growing communities. Putting into practice its corporate value of “Breeding Sustainability,” Aviagen implements efficiencies that make commercial chicken production environmentally and socially responsible and economically beneficial to producers, while at the same time promoting bird performance, health and welfare.

To meet varied market demands, Aviagen offers a full portfolio of breeding stock under the Arbor Acres®, Indian River® and Ross® brand names. The Rowan Range® and Specialty Males® target slower-growing and other niche market needs. Aviagen is based in Huntsville, Alabama, US., with operations across the UK, Europe, Turkey, Latin America, India, Australia, New Zealand, Africa and the US, and joint ventures in Asia. The company employs close to 8,000 people, and serves customers in 100 countries.

For more information, please visit Aviagen.com, or follow Aviagen on LinkedIn.

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PRESS RELEASE

Biogas Specialist WELTEC BIOPOWER celebrates Company Anniversary 20 Years of Innovation, Growth and Continuity for Renewable Energies

Germany is the global trailblazer in the field of renewable energies and the WELTEC group is one of the pioneers in this industry. Since the founding date on July 1, 2001, WELTEC BIOPOWER has focused and continued to develop from an AD plant manufacturer to an all-round specialist along the entire biogas value chain.

To this day, the group has been in the hands of a small group of powerful shareholders and has refrained from involving investors to this day. Not least on the basis of this stable ownership structure, the WELTEC Group has become one of the world's leading providers for the construction and operation of biogas and biomethane/ RNG plants. The results and projects of the last two decades around the globe speak for themselves: To date, the company, which currently employs around 120 people, has planned and installed more than 350 stainless steel energy systems on 5 continents in 25 countries. In addition, the group has invested a three-digit million Euro amount in its own plant.



Germany is the global trailblazer in the field of renewable energies and the WELTEC group is one of the pioneers in this industry. Since the founding date on July 1, 2001, WELTEC BIOPOWER has focused and continued to develop from an AD plant manufacturer to an all-round specialist along the entire biogas value chain.

Thanks to an international diversification strategy and the high product and plant quality, WELTEC has also mastered challenging phases, such as the successful turnaround in the difficult years 2014 and 2015. In 2012 and 2014, the amendment of the German Renewable Energy Law (EEG) resulted in hard reductions of the feed-in tariffs, which lead to a massive decline in biogas plant construction. Not all market players survived this time. But even under these tougher framework conditions, WELTEC BIOPOWER was able to maintain and even expand its market position.



Managing Director Jens Albartus: „We have developed our products with a high quality right from the start. But we have steadily ex-panded our portfolio over time and adapted it to the market. Therefore we have been able to de-velop extremely successfully over the past twenty years - from a pure plant planner and builder to a biogas specialist along the entire value chain.”

Jens Albartus, you have been the Managing Director of WELTEC BIOPOWER since July 2006. So you have been in charge of the group for most of the company's 20-year history. What is the success story of WELTEC?

We have always remained faithful to our mission „organic energy worldwide” and to our corporate values over the years. Besides we offer technologies of very high quality from a single source. Another important success factor is that we design the main components of our plants ourselves and have them manufactured in our region. With this we can guarantee a very high quality. We take the needs and framework conditions of our customers very seriously. Each plant is consistently designed for the requirements of our customers. Furthermore, our low staff turnover should also be mentioned. Many colleagues have been employed at WELTEC for over ten years. We stand out of the industry for twenty years due to the sum of this mixture of expertise, individuality, quality, resources and strategy.

That shows continuity. To what extent did you have to adapt or change in order to remain successful?

We have developed our products with a high quality right from the start. But we have steadily expanded our portfolio over time and adapted it to the market. Therefore we have been able to develop extremely successfully over the past twenty years – from a pure plant planner and builder to a biogas specialist along the entire value chain. Due to the expansion of our range of services with maintenance, permanent or interim plant operation, heat contracting and the production of biomethane as a fuel, our customer structure has also changed significantly. As a plant manufacturer and service provider, we work for companies in the food, waste, sewage and agricultural sectors. But we also supply horticultural companies and the real estate sector

with sustainable heat. Recently added customers and partners are from the fuel industry. Heavy-duty vehicles and trucks are already driving with our biomethane as fuel.

Which projects of the last twenty years do you particularly remember?

In 2008 we built in Könnern, Saxony-Anhalt, what was then the world's largest biomethane plant and have been operating it ever since. The project was and is an important milestone for our company group. We are all very satisfied with the successful construction and operation of this AD plant. But international pioneering projects such as the Waste-to-Energy plant for a large Australian water supplier near Melbourne and the biogas plant for the milk powder producer EDL in Uruguay are projects that I remember fondly. This plant has been providing a thermal output of six megawatts since 2018. The South Americans only use residual materials such as cattle manure and feed leftovers from 14,000 dairy cows and generate 30,000 standard cubic meters of biogas every day. This covers a third of the high heat demand of their own dairy. Just like the plant in Könnern, we have a high industrial scale there. This standard was also the reason for EDL to choose WELTEC. We've built the plant in Uruguay as a turnkey contractor, including all auxiliary works. After one year of construction, we could hand over the EPC project to the customer.

How do you build the bridge between this successful past and the future?

More than 350 WELTEC plants, around 70 percent of which are running successfully abroad, now testify to our remarkable story. In many countries we had the opportunity to do pioneering work in the field of biogas. For the future it is important to remain to our mission and to continue the success story with our strengths – as is currently happening. There is a huge potential of organic residues everywhere that can be converted efficiently and decentrally into green energy with the help of our process

technology. So right now we have construction sites in Japan, Northern Ireland and Spain. And the saving of carbon emissions is an important topic worldwide. This also includes the use of biogas in the mobility sector. Therefore I am looking forward to the next 20 years very optimistically and with great anticipation. Now things really get going!

Company Portrait

The **WELTEC** Group from Vechta, Germany, has developed into a globally leading specialist for the construction and operation of biogas and biomethane plants since it was founded back in 2001. The Group designs, plans and sets up energy plants, operates them on a permanent or temporary basis, provides 24/7 service and delivers sustainable usage concepts for output flows, thereby covering the entire biogas value chain.

The establishment of individual, technically mature solutions up to a plant size of 10 MW is one of the strengths of **WELTEC BIOPOWER**. The high proportion of custom-developed components is a key success factor. Moreover, the use of stainless-steel technologies ensures flexible substrate input, quick and inexpensive assembly and a consistently high quality standard, regardless of the location.

Following the commissioning, **WELTEC's** mechanical and biological service plays a significant role in ensuring the plant efficiency.

The company also boasts a wealth of experience in the field of biogas generation and utilisation. The company's nine decentralised plants generate 96 million standard m³ of biogas a year. Most of it is processed to biomethane and made available to energy suppliers and petrol station operators via the public gas network. Additionally, at 16 locations in Germany— e.g. in the field of horticulture, housing construction and healthcare as well as communities – the biomethane is used for generating heat within the framework of **WELTEC** energy contracting.

The biogas specialist is well aware of the importance of customer and investor proximity. Accordingly, the Group's sales and service network spans the entire globe. The range of customers includes businesses from industries such as agriculture, food, waste and wastewater. So far, the 120 employees of the **WELTEC** Group have implemented more than 350 energy plants in 25 countries on five continents. These plants save about 485.000 tons of CO_{2eq} a year.

V. Yadagiri Reddy

Chairman & Managing Director



VENCOB

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E-mail: slhpl@hotmail.com

BROILER LIFTING RATES FOR THE MONTH OF AUGUST 2021

place	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Hyderabad	114	114	116	117	117	117	117	117	107	107	109	111	113	118	123	125	128	130	130	130	130	132	132	132	132	132	123	123	123	125	125	125
Karimnagar	114	114	116	117	117	117	117	117	107	107	109	111	113	118	123	125	128	130	130	130	130	132	132	132	132	132	123	123	123	125	125	125
Warangal	114	114	116	117	117	117	117	117	107	107	109	111	113	118	123	125	128	130	130	130	130	132	132	132	132	132	123	123	123	125	125	125
Mahaboobnagar	114	114	116	117	117	117	117	117	107	107	109	111	113	118	121	123	126	130	130	130	130	132	132	132	132	132	123	123	123	125	125	125
Kurnool	114	114	116	117	117	117	117	117	107	107	109	111	113	118	121	123	126	130	130	130	130	132	132	132	132	132	123	123	123	125	125	125
Vizag	115	115	115	116	116	116	116	116	106	106	108	110	112	117	122	124	127	129	129	129	129	131	131	131	131	122	122	122	125	125	125	
Godavari	119	119	121	122	122	122	122	122	112	112	114	116	118	123	128	131	134	136	136	136	136	136	136	136	136	129	129	129	131	131	131	
Vijayawada	119	119	121	122	122	122	122	122	112	112	114	116	118	123	128	131	134	136	136	136	136	136	136	136	136	129	129	129	131	131	131	
Guntur	122	122	124	125	125	125	125	125	115	115	117	119	121	124	128	131	134	136	136	136	136	136	136	136	136	128	128	128	130	130	130	
Ongole	122	122	124	125	125	125	125	125	115	115	117	119	121	124	128	131	134	136	136	136	136	136	136	136	136	136	136	136	136	136	136	
Namakkal	113	113	113	104	100	92	92	92	92	95	95	97	100	105	108	113	116	116	116	116	116	116	116	116	118	118	118	113	113	113	113	

NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY / MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) SEPTEMBER 2021

Name Of Zone / Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Average		
	NECC Prices																																
Ahmedabad	430	430	435	440	445	450	453	453	453	453	440	442	447	452	457	460	463	465	465	465	465	465	465	465	465	467	470	472	475	477	-	455.83	
Ajmer	422	425	427	427	427	430	430	430	430	420	417	421	427	433	435	435	428	438	438	438	428	428	423	425	425	425	428	430	430	430	-	427.82	
Barwala	425	428	430	430	430	432	432	432	432	432	417	421	427	433	435	435	438	438	438	438	438	426	426	426	426	428	430	430	430	430	-	430.07	
Bengaluru (CC)	420	420	420	420	435	435	445	445	445	445	445	445	445	445	445	450	460	460	465	465	465	465	465	465	465	465	465	465	466	460	-	447.41	
Brahmapur (OD)	433	433	433	438	441	441	441	441	441	431	423	423	428	438	443	446	449	450	435	435	425	425	425	425	425	430	435	440	446	450	-	435.66	
Chennai (CC)	430	430	430	430	445	445	460	460	460	460	460	460	460	460	460	460	460	465	465	465	465	465	465	465	465	465	465	465	465	465	-	452.93	
Chittoor	423	423	423	423	438	438	453	453	453	453	453	453	453	453	453	453	458	458	458	458	458	458	458	458	458	458	458	458	458	438	-	445.93	
Delhi (CC)	445	447	452	454	454	454	455	455	455	455	440	442	445	450	455	455	460	460	460	460	460	460	460	460	460	460	460	460	460	460	-	452.17	
E.Godavari	416	416	416	419	422	425	425	425	416	416	406	406	411	421	426	431	434	437	437	437	428	428	428	428	428	431	434	437	440	443	-	425.48	
Hyderabad	390	395	400	405	410	413	413	413	413	400	400	403	408	413	418	423	426	426	426	426	426	426	426	426	429	432	435	438	441	444	-	417.86	
Ludhiana	425	427	432	432	432	434	434	434	434	425	422	420	425	430	435	438	438	440	440	440	430	430	430	430	430	430	430	430	430	430	-	430.86	
Mumbai (CC)	440	440	445	450	455	460	465	465	465	465	450	450	455	460	465	470	475	475	475	475	475	475	475	475	475	475	475	475	478	-	-	463.52	
Muzaffarpur (CC)	477	477	477	486	486	487	486	486	481	476	471	471	476	481	486	486	486	486	486	486	481	481	481	481	481	481	481	481	481	481	-	480.62	
Mysuru	421	421	421	437	437	447	447	447	447	447	447	447	447	447	447	452	452	462	462	465	465	465	465	465	465	465	465	465	465	460	-	448.52	
Nagpur	410	400	400	415	430	430	435	435	420	415	408	408	408	423	428	428	428	435	442	442	445	445	445	445	445	445	445	445	445	470	-	430.18	
Namakkal	420	420	420	430	430	440	440	440	440	440	440	440	440	440	440	450	450	455	455	455	455	455	455	455	455	455	455	455	455	435	-	439.31	
Patna	471	471	471	477	477	481	481	481	477	471	467	467	471	476	481	481	481	481	481	481	481	476	476	476	471	471	476	476	471	471	-	474.97	
Pune	420	422	428	438	444	450	453	453	453	453	440	440	445	450	455	460	465	465	465	465	465	465	465	465	467	470	473	476	479	482	-	455.45	
Ranchi (CC)	477	477	481	490	490	490	490	490	481	481	477	477	481	481	486	486	490	490	486	486	481	481	481	481	481	481	481	481	481	481	-	484	
Vijayawada	416	416	416	419	422	425	425	425	416	416	406	406	411	426	436	441	444	447	447	447	438	438	438	438	438	441	444	447	450	453	-	430.83	
Vizag	416	416	416	420	422	422	422	422	416	416	416	416	420	425	428	431	434	437	437	437	437	437	437	437	437	440	442	445	447	450	-	429	
W.Godavari	416	416	416	419	422	425	425	425	416	416	406	406	411	421	426	431	434	437	437	437	428	428	428	428	428	431	434	437	440	443	-	425.48	
Warangal	392	397	402	407	412	415	415	415	415	402	402	405	410	415	420	425	428	428	428	428	428	428	428	428	428	431	434	437	440	443	-	419.86	
	Prevailing Prices																																
Allahabad (CC)	433	433	448	452	452	452	452	443	443	438	438	443	448	452	471	471	476	467	457	448	443	448	448	448	448	452	462	467	471	471	-	453.9	
Bhopal	420	420	420	420	435	435	435	435	425	425	405	405	410	420	420	420	420	420	420	420	420	425	425	425	425	430	430	430	430	450	450	-	425.86
Hospet	380	380	380	380	395	395	405	405	405	405	405	405	405	405	410	410	420	420	425	425	425	425	425	425	410	410	415	415	420	420	-	407.41	
Indore (CC)	410	420	420	420	430	430	430	430	420	410	410	410	420	430	435	440	435	435	440	440	440	435	435	435	435	445	450	455	455	-	-	430.71	
Jabalpur	397	402	421	423	425	425	428	428	418	410	410	410	413	425	427	430	430	430	432	432	432	432	432	432	432	434	439	439	444	450	-	426.48	
Kanpur (CC)	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	467	-	462.34	
Kolkata (WB)	483	483	483	483	488	488	488	488	481	470	470	460	475	480	485	490	493	493	493	493	493	493	493	493	493	498	503	508	508	511	-	488.52	
Luknow (CC)	477	477	487	487	487	487	487	487	487	480	480	480	487	487	487	487	487	487	487	487	487	487	487	487	487	487	487	487	487	487	-	482.21	
Raipur	411	411	417	423	423	435	435	425	420	410	410	410	430	430	435	435	435	435	435	435	435	435	435	435	435	443	443	446	450	453	-	430.28	
Surat	440	440	445	450	455	460	463	463	463	463	463	450	452	457	462	467	472	475	477	477	477	477	477	477	477	477	479	482	485	488	491	-	466.93
Varanasi (CC)	460	467	477	480	480	480	480	480	480	480	473	473	480	483	487	487	487	490	490	490	490	490	490	490	493	493	493	493	487	480	-	482.38	

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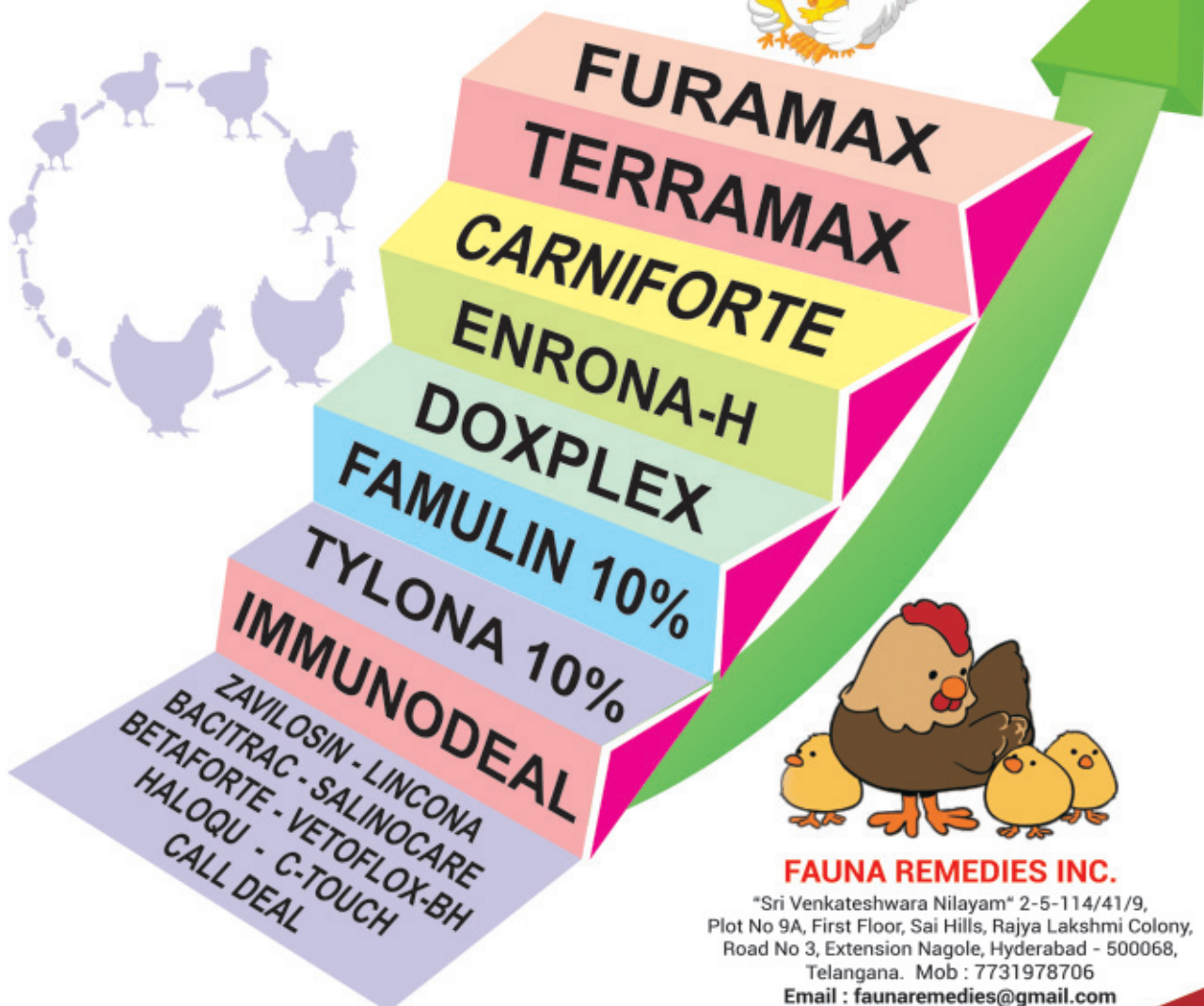
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GROWING MANAGEMENT OF COMMERCIAL PULLETS

Productive and profitable layers begin with good quality pullets. Having the correct body weight and body type at the start of egg production will enable pullets to achieve their genetic potential. Problems that develop during the growing period cannot be corrected after egg production begins. This paper will highlight the components of a good pullet development program.

HOUSE PREPARATION

The brooder house should be cleaned and disinfected well in advance of chick delivery. A minimum of 3 weeks “down-time” between flocks should be scheduled for house preparation. Before cleaning and disinfection, all manure and feed should be removed, and a rodent control program implemented (or preferably the ongoing program should be continued). This is the time to make necessary repairs to the house and equipment. The house should be cleaned with a high-pressure wet wash with detergent to remove all organic matter.

Washing should move from the ceiling downwards through the cages or system equipment to the floor and finally, manure pit. After thorough cleaning, the house should be sprayed or foamed with an approved disinfectant. Increasing the temperature inside the house will improve the effectiveness of the disinfectant. Additionally, fumigating the house within 5 days of chick delivery will help ensure sanitary conditions. The effectiveness of the cleaning, disinfection and fumigation should be checked by environmental testing of the house surfaces for coliform and *Salmonella* bacteria.

Day	Management Schedule
-21 days	<ul style="list-style-type: none"> Remove old feed and manure Clean and disinfect the growing house Rodent control program Make repairs to equipment (broken drinkers, perches etc.) Wet wash and disinfect grower house
-5 days	<ul style="list-style-type: none"> Fumigate growing house Verify cleanliness by bacterial culture of environment
-2 days	<ul style="list-style-type: none"> Start brooders in cool and cold climates Clean and disinfect water system Place paper inside cages
-1 day	<ul style="list-style-type: none"> Start brooders in hot climates Ensure that the proper brooding house temperature is provided (see table on p. 2) Minimum humidity of 40% Set lights for 20 hours of light at 30 lux Fill feeders to their highest level with fresh starter feed Adjust feed guards Adjust drinkers to proper level Flush water lines and check that all drinkers are working
+1 day	<ul style="list-style-type: none"> Fill cup drinkers or let nipple drinkers drip to stimulate water consumption Add vitamins and electrolytes to drinking water Place starter feed inside cage on cage paper (in front of feeders) Fill feeders to their highest level; floor rearing use brooder rings or partial house brooding with paper on the floor area with supplemental chick feeders and drinkers

BEFORE CHICKS ARRIVE

The house preparation should be completed 48 hours before delivery of the chicks. Allow enough time for the temperature of the air and equipment in the house to be brought to the proper brooding temperature. Be aware that air temperature rises faster than the temperature of concrete floors, litter, system equipment and water in the house. Set the light clocks to 20 hours of light at 30 lux of intensity. Lights in the red-orange wavelength (warm fluorescent) are appropriate for growing and laying birds. An intermittent lighting program for chicks should be considered. Use a well-balanced light (3500K) or a cool light (>4000K) in growing birds. To improve growth, cool light in the green-blue spectrum is preferred as it improves weight gain and helps calm birds.

Feeders should be filled to the highest level with fresh, good quality starter crumble. Adjust the feed guards to allow chicks to access feeders from day one. Ensure that all drinkers are working properly. Adjust the drinkers to the proper height to facilitate drinking by the newly arrived chicks. The birds' drinking water should contain vitamins and electrolytes to replace losses during delivery. Feed should be placed on the cage paper before chick arrival or immediately after they are placed in the cages. Chicks brooded on the floor should be provided extra feed trays or be fed off cardboard.

CHICK QUALITY – IN THE BEGINNING

Layer pullet chicks must be sourced from breeder flocks that are healthy and free of vertically-transmitted diseases important for bird and human health. Chicks should possess adequate levels of maternally-derived antibodies for early protection against challenges of infectious bursal disease (Gumboro, IBD), Newcastle disease, infectious bronchitis and other diseases. The chick should be of adequate body weight with a well-healed navel (umbilicus) and free of physical defects.

All chicks should be vaccinated against Marek's disease in the hatchery using the Rispens + HVT strains. In the hatchery, other vaccinations can be administered by using HVT-vectored vaccines containing infectious laryngotracheitis (ILT) or IBD (Gumboro) protective genes. If HVT-vectored vaccines are used, do not combine with another HVT strain vaccine, although Rispens may be used in combination. For more information on vaccination programming, see the "Vaccination Recommendations" technical update. Chicks may also receive an infrared beak treatment in the hatchery (see the "Infrared Beak Treatment" technical update). The transportation time of the chick delivery from hatchery to farm should be kept to a minimum. Chicks derived from different breeder flocks should be kept separate and mortality records maintained for each breeder source.

BROODING PERIOD – GETTING OFF TO A GOOD START

Pullet chicks arriving to the farm from the hatchery should be alert and active. Chicks must be vigorous enough to explore their new environment and quickly find feed and water. Eating feed and drinking water quickly will speed the development of healthy intestinal microflora and build resistance to enteric pathogens such as *Salmonella* and *E. coli*. During the first week of life, chicks must be provided with constant attention by the manager to ensure optimized temperature, humidity, lights, feed and water availability. The first 2 weeks of life are when the most significant problems for proper chick development can occur. The newly hatched chick is unable to regulate body temperature and must be provided the proper environmental conditions. Relative humidity during the first week should be above 40% to prevent dehydration, drying of mucous membranes and vent pasting. The use of heaters to maintain brooding temperature will reduce relative humidity.

RECOMMENDED BROODING TEMPERATURES

Days of Age	Hy-Line Brown, Silver Brown, Pink and W-80		Hy-Line W-36 and Sonia	
	Cage	Floor	Cage	Floor
1-3	33-36°C (40-60% relative humidity)	35-36°C (40-60% relative humidity)	32-33°C (40-60% relative humidity)	33-35°C (40-60% relative humidity)
4-7	30-32°C	33-35°C	30-32°C	31-33°C
8-14	28-30°C	31-33°C	28-30°C	29-31°C
15-21	26-28°C	29-31°C	26-28°C	27-29°C
22-28	23-26°C	26-27°C	23-26°C	24-27°C
29-35	21-23°C	23-25°C	21-23°C	22-24°C
36+	21°C	21°C	21°C	21°C

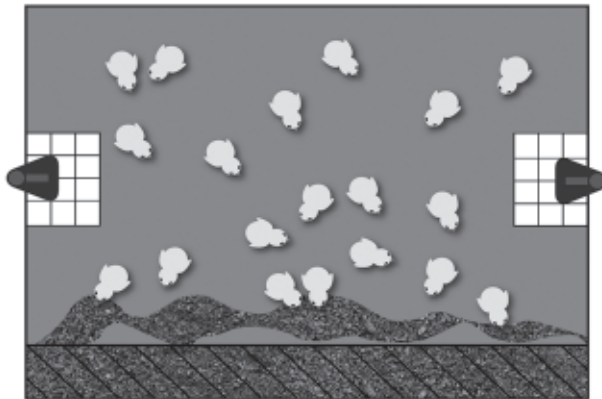
GROWING SPACE RECOMMENDATIONS FOR CHICKS (0-3 WEEKS)

(check local regulations regarding space)

	Colony/Cage	Floor
Bird space	100–200 cm ² /bird (16–31 in ² /bird)	835 cm ² /bird (0.9 ft ² /bird)
Feeder	5 cm/bird (2 in/bird)	5 cm/bird (2 in/bird) or 1 pan per 50 birds
Cups or nipples drinking system	1 per 12 birds	1 per 15 birds
Fountain drinking system, 46 cm (18 in) diameter	—	1 per 125 birds

Brooding chicks in cages requires strict management of temperature and humidity as the chicks cannot migrate to an area of comfort like chicks grown on the floor. Chicks started in cages should be placed on paper for 7 to 10 days to help their movement within the cage, temperature control, prevent drafts and allow supplemental feeding on the paper. Feed should be placed in front of the feed trough to train chicks to move toward the permanent feeders.

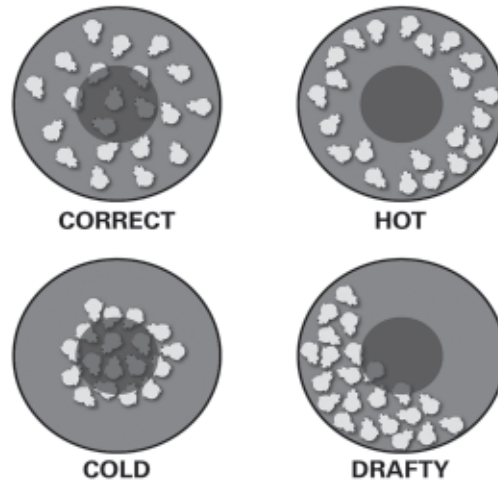
Place feed in front of automatic feeders



During the first week, chicks benefit from bright light conditions in the house. Minimum light intensity should be 30 lux with clocks set to 20 hours. Alternatively, if local regulations allow, an intermittent lighting program can be used (4 hours of light followed by 2 hours of darkness, repeated for the first 7 to 14 days). In order to encourage water consumption, keep cup drinkers full of water for the first 3 days or adjust water pressure to cause a hanging drop of water in nipple drinkers. Chicks that fail to adapt to their environment and are delayed in finding feed and water will die at 4 or 5 days of age when the yolk sac is depleted.

Chicks raised on the floor in houses heated with brooder stoves or whole-house heating should be confined in brooder rings. Observe chick behavior to determine if the temperature is correct. Chicks should be uniformly distributed in the brooding area. Closely grouped chicks indicate low temperatures or excessive drafts. In cold environments chicks will often chirp with a distressed tone. Chicks that are too warm will appear lethargic and will try to move away from the heat source. Both heat and cold-distressed chicks can have pasty vents.

Brooding Temperature, Floor Brooding in Rings



ADDITIONAL CONSIDERATIONS FOR FLOOR-RAISED BIRDS

Floor-raised pullets may use pan or chain feeders. For both feed systems, it is important to start chicks by feeding on paper, cardboard, or trays that are placed near the feed line. When the chicks first arrive, be sure either the pans or troughs are completely filled to help the chicks find the permanent feed source. Carefully monitor the control panel to ensure that all feeders on the line remain full.

When using brooder rings, there may not be sufficient access to water. Provide supplemental water with chick drinkers for the first week or two, or until the rings are opened up to full water access.

If perches are integrated onto the feed or water lines, it is important to minimize manure build up. Water lines with perches should use small or no-drip cups, as large drip cups tend to collect manure from perching birds.

Many diseases affect floor-raised birds more than cage-raised birds. In particular, infectious bursal disease and coccidiosis must be well controlled to ensure good uniformity and weight gain. Veterinarians with knowledge of the local disease burden should be consulted to implement an appropriate control program.

TEACH GOOD BEHAVIOR EARLY

Pullets going into enriched colony, barn or aviary laying environments should be provided growing environments containing perches, water platforms or multi-tiered environments. While chicks are usually started on the floor, it is important to set up the platforms or enriched environment by 3-4 weeks of age. If water platforms are used, it is important that pullets continue to have access to water on the floor until the flock learns to jump.

Complex environments teach pullets jumping and exploratory behaviors. Pullets raised in enriched growing environments adapt better to complex laying environments. By learning to jump and explore at an early age, adult behavioral problems such as piling or not utilizing all levels in a multi-tiered system can be reduced.

Human contact during the growing period socializes pullets and reduces stress. Walking the house perimeter multiple times daily during the growing period aids socialization and can improve nesting behavior in layers. Using the same type of drinkers in pullet and layer houses improves adaptation in the layer house.

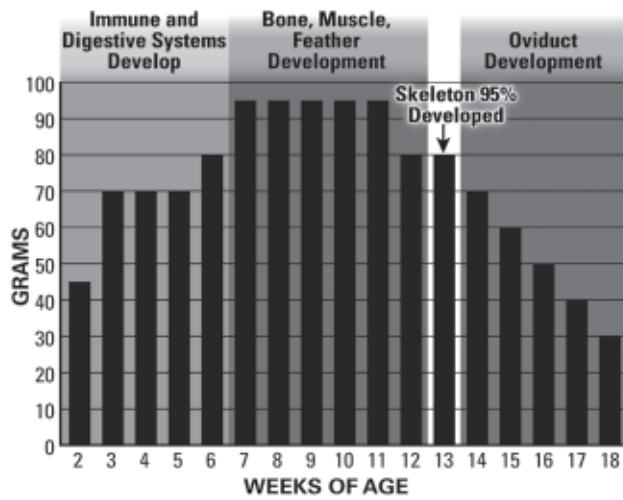


PULLET DEVELOPMENT AND WEIGHT

The pullet develops according to a well-orchestrated sequence of physiologic events. Pullets reaching or exceeding breed body weight targets during these developmental phases have the best chance to perform to genetic potential as layers. Interrupted growth during any of these developmental phases will result in hens lacking the body reserves and organ function to sustain high production as adult layers.



Weekly Body Weight Gain and Organ Development during the Growing Period



The growing period can be divided into the following periods:

0 TO 6 WEEKS OF AGE

During this period, the organs of the digestive tract (supply organs) and the immune system undergo much of their development. Problems during this period could have permanent negative effects on the function of these systems. Birds stressed during this period might have lifelong disability in digestion and the absorption of feed nutrients. Immunosuppression could also result from problems during this period leaving the bird more susceptible to disease and less responsive to vaccinations.

6 TO 12 WEEKS OF AGE

This period of rapid growth is when the pullet attains most of the adult structural components (muscles, bones and feathers). Poor growth during this period will prevent the pullet from attaining sufficient bone and muscle reserves needed to sustain a high level of egg production and maintain good shell quality. The skeleton is 95% developed by the end of the 13th week of life. At this time the growth plates of the long bones calcify and no further increases in bone size can occur. Any compensatory growth occurring after this period will not increase the size of the skeleton. The amount of mineral reserve available for egg shell formation is directly related to the hen's skeleton size. Reactive vaccinations, beak trimming, bird handling and other stressful management practices can delay development during this period of rapid growth.

12 TO 18 WEEKS OF AGE

During this period the growth rate slows and the reproductive tract matures and prepares for egg production. Development of muscle continues and proliferation of fat cells occurs in this period. Excessive body weight gain during this period can result in pullets with an excessive amount of fat pad. Low body weights and stressful events during this time can delay the onset of egg production. Seven to ten days prior to the oviposition of the first egg the medullary bone within the cavities of long bones can be increased by feeding a pre-lay ration with increased levels of calcium.

TARGET BODY WEIGHTS AT CRITICAL POINTS OF DEVELOPMENT

	W-36	W-80	Brown	Silver Brown	Sonia	Pink
6 WEEKS Development of immune and digestive systems	410– 430 g	410– 440 g	450– 470 g	470– 490 g	490– 500 g	480– 500 g
12 WEEKS Development of skeleton and muscle	950– 970 g	920– 990 g	1050– 1110 g	1060– 1120 g	1110– 1120 g	1110– 1130 g
17 WEEKS Development of the reproductive tract	1230– 1270 g	1170– 1250 g	1400– 1480 g	1500– 1580 g	1440– 1450 g	1440– 1480 g
40 WEEKS Evaluates adequacy of layer nutrition	1520– 1560 g	1590– 1710 g	1870– 1990 g	1960– 2080 g	1900– 1950 g	1870– 1950 g

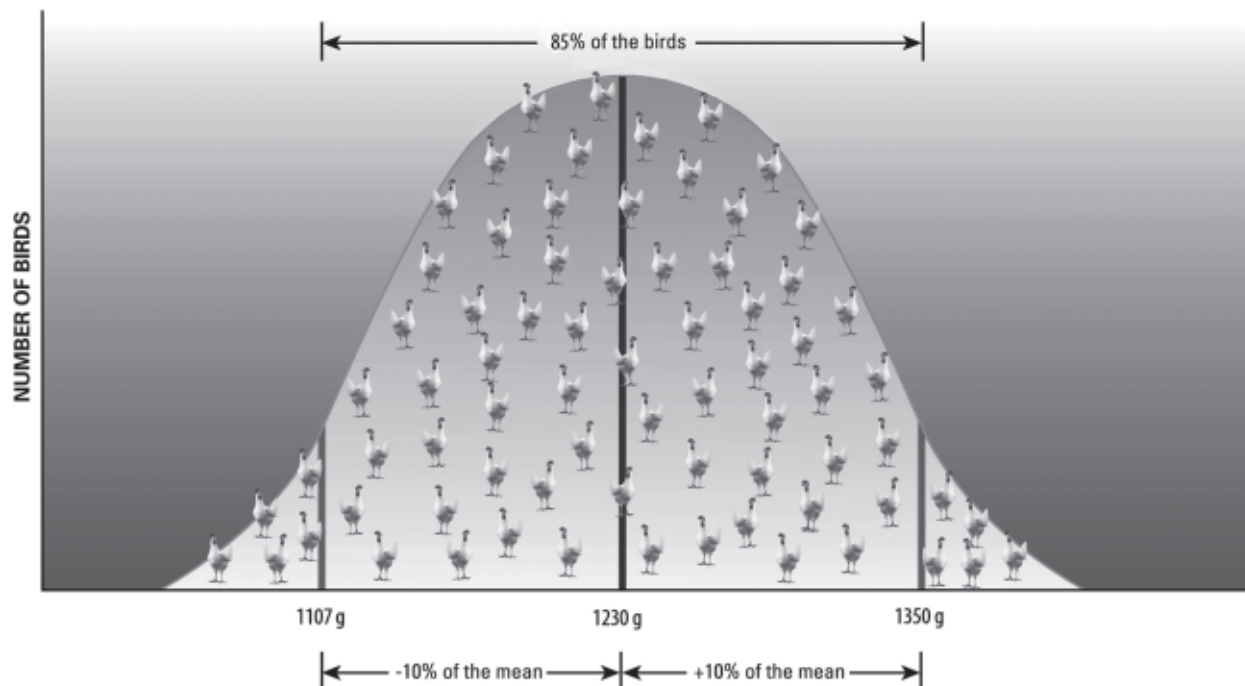
BODY WEIGHT UNIFORMITY

Uniformity of body weights within a flock is as important as achieving the target average body weight. The proper goal during the growing period is 85% uniformity (85% of the individual bird weights are +/- 10% of the average). Poor pullet body weight uniformity complicates the proper feeding of the flock both in grow and lay, and is the most important factor causing poor peak of production and substandard egg production. Another challenge resulting from poor uniformity is pullets coming into production at different times, with underweight hens producing small eggs.

Reasons for pullet poor uniformity include:

1. Enteric diseases such as coccidiosis, infectious bursal disease (Gumboro, IBD), spirochetosis, viral or bacterial enteritis, runting/stunting
2. Overcrowding leading to competition at feeders and drinkers
3. Inadequate nutrition because feed formulation does not match actual feed intake
4. Feed refusal due to poor quality, mycotoxins or abrupt changes in feed ingredients disrupting intestinal microflora
5. Feed management
 - a. Not enough feedings or stimulations
 - b. Slow movement of feeders leading to selective feeding
 - c. Not allowing the feeder to be emptied daily, leading to accumulation of fine feed
 - d. Improper feed particle size (see the "Feed Granulometry" technical update)
6. Stress from vaccination, excessive bird handling, heat stress
7. Poor beak trimming technique
8. Any restriction of water consumption will also reduce feed intake. Water must be freely available at all times. Causes of water intake problems include:
 - a. Overcrowding or equipment failure
 - b. Improper height of drinkers

GOOD BODY WEIGHT UNIFORMITY GOAL



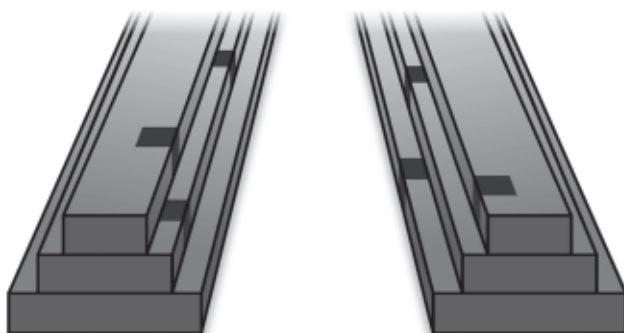
In flocks with poor uniformity it may be necessary to segregate the birds by weight and then feed separately. Birds on the floor can be separated into pens of different weight classes. When the birds cannot be separated, the flock should be fed according to the requirements of the lighter birds in the flock.

A weight monitoring program should begin when the flock is 1 week old. During the first 4 weeks when the birds are still small, bulk weigh random samples of 20 birds. After 4 weeks of age, individual bird body weights should be taken weekly from at least 100 birds. Continue weighing weekly until mature body size is reached at 32 weeks, then at least every 5 weeks during the remainder of the production period. For pullet flocks raised in cages, a selection of cages from all levels and positions within the house should be marked. All the birds in these cages should be weighed separately with the birds from the same cages weighed every week. Select cages at the beginning and end of feed lines, as well as from upper and lower levels.

Flocks raised on the floor can only be weighed randomly, but can be collected from several different locations. Platform scales can be used to continuously monitor growth, in addition to manual weighing.

Weekly monitoring of body weights is preferable as the producer can identify growth problems quickly. It might be possible to associate the growth problem with a change of feed or a stressful management practice, allowing corrective action to be taken.

RANDOM SAMPLING



Weigh birds prior to a scheduled change in feed formulation, such as from starter to grower feed. Scheduled changes in feed formulations should always be based on achieving target body weights and not the age of the flock. Underweight pullet flocks or flocks with poor uniformity should be retained on the more nutrient rich formulation. Flocks that will be receiving a harsh vaccination involving handling the birds for injection or during peak heat waves (acute heat stress) should be placed back on more concentrated feed formulations to compensate for loss of appetite.

BREAST MUSCLE DEVELOPMENT

Pullets should be examined for breast muscle development as a good indicator of proper pullet development and a predictor of future layer productivity. Muscle contains glycogen, a rapidly available source of energy used for egg production. Pullets coming into egg production with insufficient muscle will not have sufficient energy available to sustain high egg production.

PROPER BREAST MUSCLE DEVELOPMENT



LIGHTING PROGRAMS

Step-down lighting programs modulate growth, determine age of sexual maturity and affect egg size and egg mass (within the genetic limits of the layer variety).

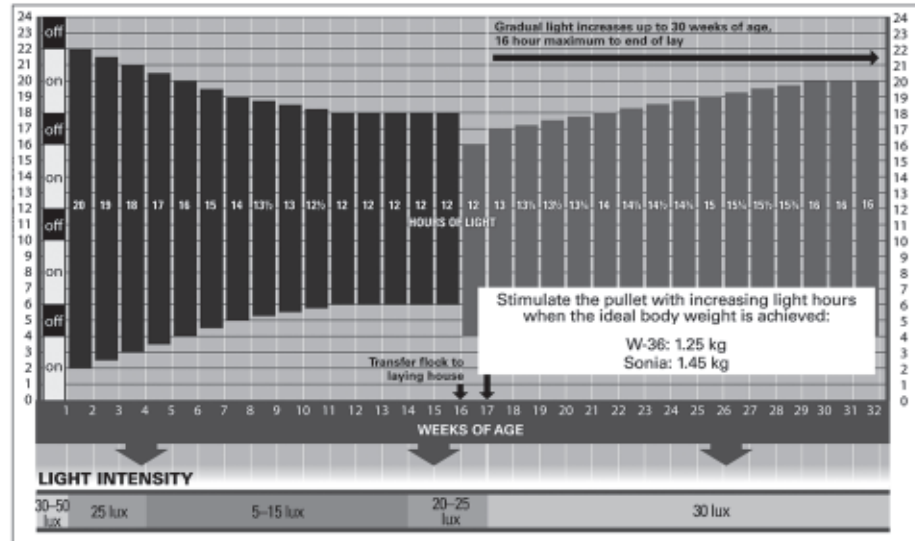
In a typical step-down lighting program, the hours of light are gradually decreased over the first 8–12 weeks. This provides the young growing flock additional hours of feeding time to promote growth. Age of sexual maturity and egg size is not affected if the step-down period is 12 weeks or less. When the step-down period is extended beyond 12 weeks, sexual maturity will be delayed and egg size increases. Step-down periods longer than 12 weeks are appropriate in commercial egg markets requiring large eggs or in breeder flocks requiring larger egg weights for hatching. On the contrary, fast step-down (< 8 weeks) can be used to stimulate rapid onset of lay and to reduce egg size, but this system needs to be applied only if pullet body size is on target.

In open housing, the artificial lighting programs must complement the natural day length. After the initial step-down in lights over the first 12 weeks, the artificial lights are set to the longest natural daylength the flock will experience during the growing period. This will negate the influence that changes in natural daylength would have on pullet development and the age of first egg. A lighting program web tool is available at www.hyline.com that provides a customized lighting program for any location.

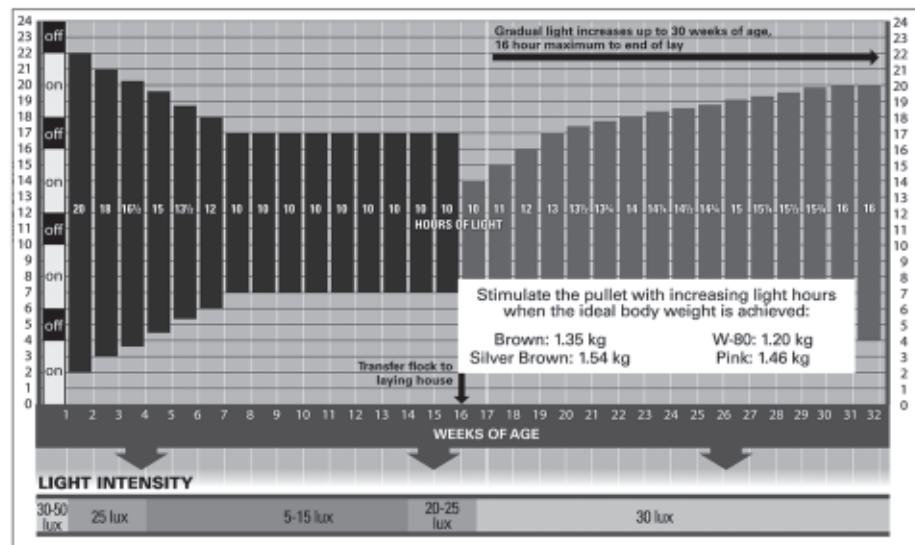
CONCLUSION

Careful attention to the principles of pullet management is fundamental for success and profits in laying flocks. Growing a pullet flock of the correct weight and body conformation will usually ensure success in the laying period. Problems such as low egg numbers and poor egg shell quality during lay can often be traced back to problems occurring in the growing period.

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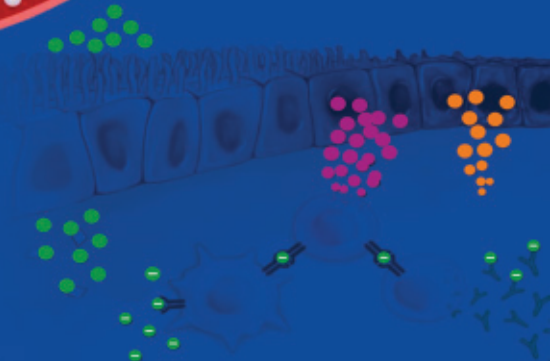


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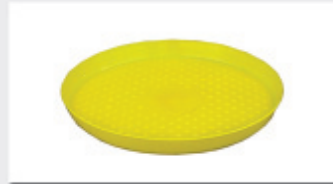
POULTRY EQUIPMENTS



Chick Feeder



Egg Tray



Chick Feed Tray



Chick Drinker



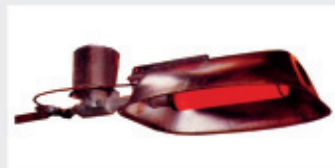
Drinker
(Assemble Valve System)



Deluxe Drinker
(Standard & Large)



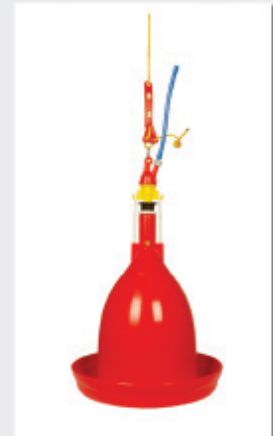
Feeder



Gas Brooder



Chain Link Mesh



Jumbo Drinker



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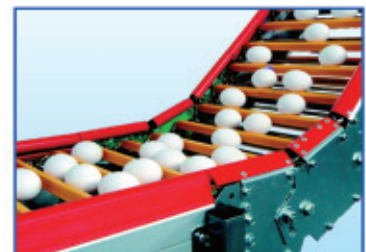
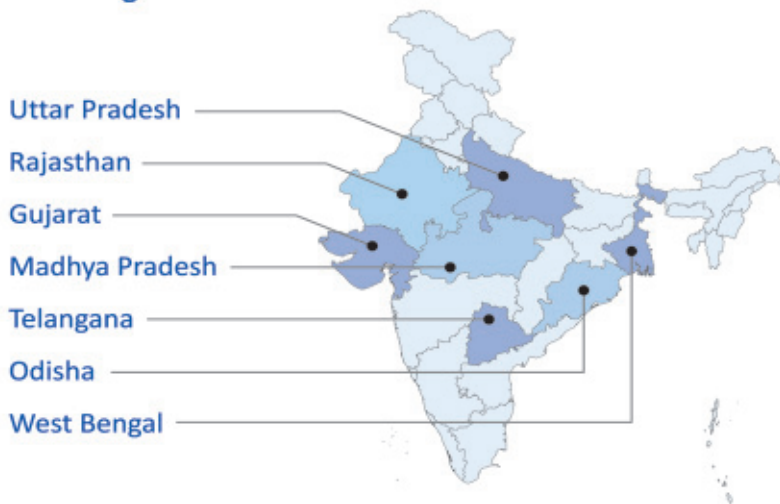


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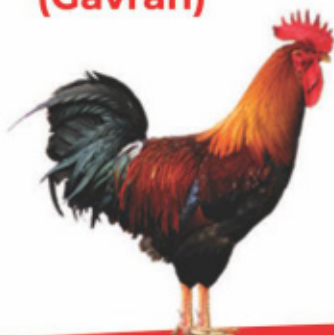


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