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INSIDE

Nutrient Analysis of Poultry Litter and Possible Disposal Alternatives

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Introduction

Recent work has shown that a 40 x 400' broiler house will produce about 105 tons of litter per year (Tabler, 2000). Since there are an estimated 13,000 broiler houses in Arkansas, this means that about 1.4 million tons of litter are generated in the state annually. Management of poultry litter has become an important issue for Arkansas farmers, the poultry industry and the general public as attention on the environment increases. New and innovative methods of utilizing litter continue being researched, but land application of litter remains the most common use. Litter contains essential nutrients for plant growth. It also contains organic matter that improves soil characteristics. For both of the above named reasons, there is rising interest in eastern Arkansas in using poultry litter as a soil fertilizer. Also, chicken litter is well known as a valuable fertilizer for pasture and forage production which is vital to most Arkansas cattle operations.

While the fertilizer value of litter is well recognized, the nutrient concentration of litter can be extremely variable depending on a variety of factors. Yet without correctly sampling and analyzing litter before it is spread, there is no way to know its fertilizer value. In addition, soil testing is necessary if land application of litter is to be done accurately. Regular analysis of both litter and soil should be important parts of the Best Management Practices program on your farm.

Litter Nutrient Analysis

Litter has been shown to vary widely in its range of nutrient content (Table 1) and a number of factors can influence the nutritive value of litter. However, we have probably all wondered how nutrient concentration of litter changes with successive flocks. Figure 1 demonstrates the litter nutrient analyses of 9 flocks of 6-week birds grown on the same litter. Litter nutrients increased rapidly for three flocks, then slowed in later flocks, but continued to increase. While all nutrients increased with successive flocks, nitrogen and phosphorous assays tended to have more dramatic increases than potassium and calcium.

The data graphed in Figure 1 are shown in Table 2 along with other data. Litter pH ranged from a low of 6.9 after flock 5 to a high of 7.8 after flocks 7 and 9. Litter pH is important because greater amounts of ammonia are produced if pH is basic (greater than 7). Litter treatments that lower ammonia production do so by lowering the litter pH and making the litter more acidic (pH less than 7). Moisture content ranged from a high of 36% after flock 5 (February) to a low of 22.3% after flock 9 (August). Litter moisture was higher from October through March (colder season of the year when curtains are closed and minimum ventilation is used) than from March through August (warmer season when curtains are down or tunnel ventilation is in use). This emphasizes the importance of adequate ventilation in keeping dry floors. Ash is a measure of the inorganic (or mineral) portion of litter. The ash content ranged from 19.6% after

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flock 1 to 26 % after flocks 3 and 8. These were typical ash values as chicken litter has a high ash content of roughly 25%.

Data in Table 3 show litter assay values for four years of broiler production (2 years of 8-week birds and 2 years of 6-week birds) at the Applied Broiler Research Unit. During this time, a 12-month cleanout schedule was followed each year except for 1996 when cleanout was at 16 months. The nutrient values in Table 3 are generally higher than those in Table 2, but are well within the range of values shown in Table 1. The last two columns show litter production in pounds of litter ("as-is" and dry weight) produced per pound chicken liveweight per year. These units allow the estimation of litter production regardless of house size, bird numbers or bird size. The averages of 0.55 lb wet litter, or 0.42 lb dry weight, per lb bird weight, represent the litter produced by annual cleanouts. Chicken litter is relatively lightweight, in this case weighing between 30.5 and 41.5 lbs per cubic foot (Table 3). This fact should assist in determining transportation and handling costs.

Economics of Litter Disposal

A well-managed, 25,000-bird poultry house can annually produce 5.5 flocks of birds weighing 4.5 pounds with 94.5% usable birds that dress 75%. This is equivalent to 414,176 lbs of marketable whole-bird poultry per year (Doye et al., 1992). This house will generate about 125 tons of litter annually, or about 0.6 pounds of litter per pound of marketable meat produced. According to Goodwin (2003), the current hauling cost for a 25 ton tractor trailer load of litter is roughly $3.00/mile. This would be $0.12/mile/ton or $0.00006/mile/lb. If each bird contributes 0.6 pounds of litter per pound of bird, then the cost of transporting litter, on a per pound of poultry produced basis is 0.6 x $0.00006/mile/lb, or $0.000036/mile. In plainer English, it would raise the production cost of poultry $0.000036/pound to transport litter associated with producing the poultry, 100 miles. These increased costs will likely have to be passed on to consumers. It has been estimated that about fifty percent of the litter in concentrated poultry production areas of the United States is surplus (i.e. cannot be land applied in that region) (Wimberly, 2002). Thus, on average, alternatives are needed for managing approximately 50-70 tons of litter generated each year at a typical broiler production facility located in such an area (Wimberly, 2002).

Other Options

Recent environmental concerns have focused increased attention on developing wider litter use alternatives. One alternative being examined is using litter as a fuel source for heating poultry farms. If perfected, such a use would address some of the environmental concerns associated with traditional litter management practices and reduce operating expenses (Wimberly, 2002). However, the challenges associated with making on-farm litter-to-energy systems a reality are substantial. Wimberly (2002) reported that there are numerous advantages associated with large-scale, centralized litter-to-energy options. Although centralized systems are commercially proven, to operate efficiently such systems would require the use of most, if not all the litter in a given area. Thus, centralized litter to energy systems would require the support of many if not all the area growers.

Summary

The Arkansas poultry industry generates an estimated 1.4 million tons of broiler litter annually. While litter is still a valuable fertilizer resource that is needed in many areas, litter generated in poultry-producing regions cannot be properly utilized in those regions alone. By some estimates, alternative uses for perhaps as much as half the litter generated in concentrated production areas must be found. This may mean transporting litter to areas in need of its fertilizer and organic matter, and how best to do this is currently being addressed. One alternative being examined is using litter as a fuel source. While on-farm use of litter as a fuel would address many environmental concerns associated with traditional litter management practices and reduce operating expenses, the challenges associated with making on-farm litter-to-energy systems a reality are substantial. Although there are numerous advantages associated with large-scale, centralized litter-to-energy options, to operate efficiently such systems would require the use of most, if not all the litter in a given area.

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Berry, I. L. 1997. Litter production at the Broiler Energy Project. Pages 9-10 *In*: Progress Report: Broiler Energy Project 1995-97. Center of Excellence for Poultry Science, Coop. Ext. Ser., Agri. Exp. Sta., University of Arkansas, Fayetteville.

Table 1. Typical Range of Nitrogen, Phosphorus and Potassium Values for Broiler Litter[1]

	% H_2O	N	P_2O_5	K_2O	Ca
	<---	lbs/ton			--->
Minimum	2	22	18	23	18
Maximum	47	98	96	80	108
Mean[2]	23	60	58	52	45

[1] Adapted from VanDevender et al., 2000.
[2] Values are for 2,054 broiler litter samples analyzed by University of Arkansas Agricultural Diagnostics Lab from 1993 to 2000.

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Table 2. Litter nutrient analysis at Applied Broiler Research Unit during 9-flock growout[1]

Date	Flk Length (Days)	Flocks on same litter[2,3]	pH	Moisture (%)	Ash (%)	N	P_2O_5	K_2O	Ca
						<--------- lbs/ton on as-is basis---------->			
Jun-95	41	1	7.4	33.1	19.6	33.8	42.5	36.6	36.2
Aug-95	41	2	7.6	31.5	22.5	43.6	47.9	44.1	43.0
Oct-95	41	3	7.6	28.7	26.2	51.8	57.7	45.6	46.1
Dec-95	40	4	7.2	33.8	24.6	51.0	51.0	44.2	42.6
Feb-96	45	5	6.9	36.0	24.4	55.3	52.9	48.4	43.2
Mar-96	41	6	7.5	34.7	24.9	53.0	52.8	45.6	41.2
May-96	42	7	7.8	27.3	24.0	62.9	58.2	52.9	47.4
Jun-96	42	8	7.3	28.7	26.0	49.5	59.3	54.2	47.3
Aug-96	43	9	7.8	22.3	22.6	60.3	69.3	58.3	53.5

[1] Initial bedding material was 50/50 mix of rice hulls and pine shavings/sawdust.

[2] Caked litter was removed after each flock, but samples were taken before cake removal.

[3] Figures are averages of four 40 x 400' houses on the farm.

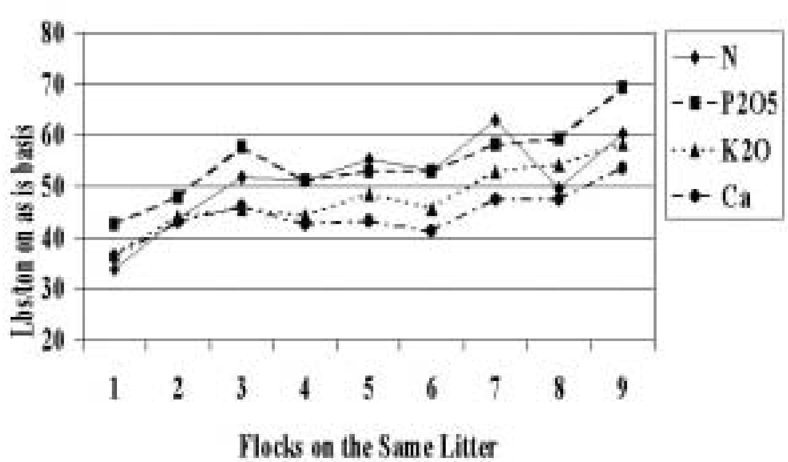
Table 3. Litter production variables from four years of broiler production at the Applied Broiler Research Unit[1]

Date	Bird (Wks)	No. of Flocks	pH	H_2O (%)	Ash (%)	N	P_2O_5	K_2O	Ca	Depth (in.)	Density (lb/ft^3)	Lb Litter[2]/ Lb Chicken	Lb Dry/ Lb Chicken
						<---Lbs/ton on as is basis-->							
Apr-93	8	6	7.25	23.78		57.7	57.0	64.1	41.7	6.44	30.50	0.484	0.369
Apr-94	8	5	6.87	28.13	27.20	58.1	68.0	49.1	51.0	5.13	37.09	0.649	0.466
Apr-95	6	7	7.61	25.04	26.61	55.9	66.1	52.5	53.2	3.96	35.14	0.544	0.407
Aug-96	6	9	7.80	23.09	23.87	57.5	68.4	58.0	54.2	4.64	41.58	0.540	0.416
AVG:			7.38	25.01	25.89	57.3	64.9	55.9	50.0	5.04	36.08	0.554	0.415

[1]Adapted from Berry (1997)

[2]As is

Figure 1. Litter Nutrient Analyses from 9 Flocks



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Sexing Chicks in the Backyard Flock

Introduction

Many backyard flock owners wonder: "When my baby chicks grow up, will they be boys or girls, roosters or hens, lay eggs to eat or crow endlessly in the early morning hours?" Regulations against owning roosters within city limits may exist in some of the larger cities. Not wanting to watch roosters fight and possibly injure each other in the hustle to establish dominance in their little world, or simply wanting to have a flock of only hens to gather the eggs each day for the family to eat. These are some points that cause concern and are important for the backyard chicken grower who tries to sex their chickens before they hatch, or grow up in this case.

"Old Wives Tales" about Sexing

Sexing baby chicks is not an easy process. There are a few who would try to simplify the matter with "old wives' tales" of how to sex baby chicks. One method often repeated is tying a needle or a weight to the end of a piece of string (if the subject to be tested is an expectant mothers' stomach, use a wedding ring on a string) and hold it over the young animal. One interpretation of this method says that if the object rotates in a clock-wise circle, it is a male; if it rotates counter-clock-wise, it is a female. Similarly, with the same object on a string held over the baby chick, the motion of the hanging object in any circular pattern indicates a female while movement of the object back and forth indicates a male. Success of this method has been "reported" to be as high as "it will work *every time*" to "it works most of the time." In actuality, one should expect to be accurate about 50% of the time when determining the sex of baby chicks in this manner (accuracy may be slightly higher for inherently lucky individuals).

A second method is to observe the shape of an egg to determine the sex of the potential young chick to be hatched. One individual explained that the different sexes require different shaped eggs for optimum growth within the shell and that the hen's body knows which sex the chick would be. Football-shaped eggs house boy chicks, and more oval or round-shaped eggs will house girl chicks. He went on to say he was "nearly 100% accurate" when sexing chicks by this method. In actuality, the shell of the egg is formed simply by the presence of *any* object within the oviduct. Years ago someone surgically placed an engagement ring in the upper portions of the oviduct and allowed the hen to form an egg (albumen and shell, no yolk) around the ring. The egg was then given to the girl in the form of a marriage proposal. The ring had no sex, but the shell was formed regardless. Similarly, a rock placed in the oviduct or more naturally sometimes detached body tissues in the oviduct can stimulate the formation of an egg by the hen. The accuracy of this method is about 50%, again, slightly higher for lucky individuals.

In a recent meeting it was mentioned that birds might be similar to reptiles in that the temperature in which the eggs are incubated largely determines the sex of the developing chick. Imagine if this were true, how valuable this would be to the poultry industry! Commercial egg producers could hatch only young pullets; chicken and turkey meat producers could hatch male chicks for one market and female chicks for a different market. Unfortunately, it is not quite that simple in domestic poultry. Too much deviation from the optimum incubation temperatures will most certainly result in fewer chicks hatched. Likely some of each sex will be lost.

Accurate Methods of Sexing

Fortunately, there are some methods for sexing baby chicks that are actually accurate. Using our knowledge of genetics with the proper breeding scheme, day old baby chicks can be sexed based upon their color. This is possible when using what is called sex-linked color traits. Mating barred hens (black and white striped feathers) with non-barred males results in barred males and non-barred female chicks. This can also be accomplished using birds carrying specific genes for silver and gold color patterns in the roosters and hens (silver males bred with gold females results in silver pullets and gold cockerels). From a genetic standpoint (excluding mutations), this method is always accurate.

Vent sexing baby chicks is a method popularized in the 1930s by a Japanese professor, Kiyoshi Masui. Individuals well trained at chick sexing schools can consistently and easily attain greater than 95% accuracy. This method involves holding the day old chick upside down in one hand and while visually examining the vent area for the presence or absence of a rudimentary male sex organ. This method sounds much easier than it really is. After being taught the basics of this technique from non-professionals, most people would be doing well to obtain 60-70% accuracy at best. However, if interested, additional written information on this technique can be obtained from the Center of Excellence for Poultry Science at the University of Arkansas. Most commercial hatcheries that offer chicks for sale as either pullets or cockerels utilize this method.

All in all, the best way to sex chickens in the backyard flock is to watch them grow. Feed them, water them, observe them and enjoy them while they mature. As they develop, changes will become obvious as the males will begin to act manly and their voices will change from the chirping common to young chicks to attempted crows. In nearly all breeds of chickens (Sebrights being the exception) the young males' feathers will also change from the round oval-shaped feathers common to hens and young birds to the shiny, more narrow and pointed feathers found on their necks and at the base of their tails. Additionally, the combs of the young roosters will begin to develop at an earlier age than they will in females. While this may vary from breed to breed and, in some breeds, might even be difficult to detect a difference; in most breeds of chickens with large combs, this is a very obvious distinction between young roosters and hens as they are maturing. In short, enjoy the birds and watch them grow. This is definitely the most enjoyable method when establishing a backyard flock.

All in all, the best way to sex chickens in the backyard flock is to watch them grow.

Summary

While a number of "old wives tales" exist about sexing chicks, these methods are no better than flipping a coin. While feather sexing and vent sexing are accurate methods of determining the sex of chicks, perhaps the best and most enjoyable method is just watching the birds grow.

Coming Events

- **Annual Nutrition Conference**, September 9-11, 2003, Clarion Inn, Fayetteville, AR, The Poultry Federation (501) 375-8131
- **Turkey Management Meeting**, September 19-20, 2003, Inn of the Ozarks, Eureka Springs, AR, The Poultry Federation (501) 375-8131
- **Ozark Producers Symposium**, October 7, 2003, Whittaker Arena, University of Arkansas, Fayetteville, AR, Dr. Susan Watkins (479) 575-7902
- **The State Fair**, October 10-19, 2003, State Fair Grounds, Little Rock, AR, State Fair Office (501) 372-8341
- **Processors Workshop**, October 15-17, 2003, Clarion Inn, Fayetteville, AR, The Poultry Federation (501) 375-8131.

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Avian Reovirus Infections

Reoviruses are widespread in nature and have been isolated from a variety of animals. These viruses have also been isolated from humans and in fact the name reovirus is a mnemonic for respiratory (r) enteric (e) orphan (o) since the virus was isolated from the human respiratory and enteric tract, but was not associated with disease. In some species of mammals (primarily mice) these viruses have caused liver, pancreatic, lung, and heart disease and central nervous system symptoms.

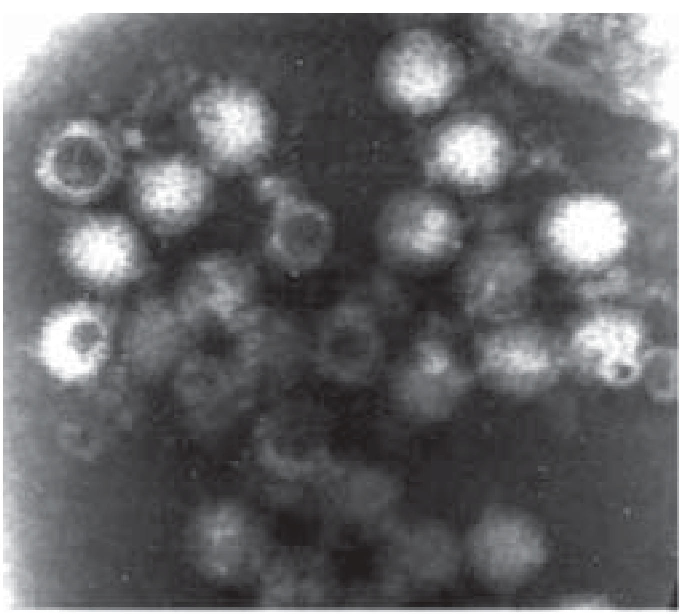
Avian reoviruses, in the past, have been associated with viral arthritis/tenosynovitis, malabsorption syndrome, stunting/runting syndromes, enteric disease, immunosuppression, and respiratory disease. Recently, there have been reports from the field and isolations of reoviruses from chickens exhibiting neurological signs.

AVIAN REOVIRUS DISEASES

Reoviruses were first isolated from chickens in 1954.

Viral Arthritis - Reoviruses were first isolated from chickens in 1954. This isolate (Fahey-Crawley) produces viral arthritis/tenosynovitis when inoculated into chickens. In field situation viral arthritis is seen primarily in meat type strains of chickens, but has been reported in egg type chickens and in turkeys. While birds are usually affected with the disease at 4-8 weeks of age, older birds can also be affected naturally and younger birds experimentally. As would be expected, birds with the disease, varying degrees of lameness is a typical sign of the disease. Some birds may also be stunted in size. The lesions observed are swelling and inflammation of the hock joint and tendon sheath with a yellow colored fluid present in the hock. The fluid may be tinged with blood or occasionally it contains purulent (pus) exudate. As the inflammation progresses over time; scar tissue forms and may fuse tendons and sheaths together. Bones of the joint may also become eroded or pitted And rupture of the gastrocnemius tendon may be present.

Mal-Absorption / Pale Bird Syndrome - Reoviruses have also been isolated from birds with mal-absorption/mal-digestion/pale bird syndrome. Affected birds are stunted, unthrifty, have poor feed conversions and generally look sick. Orange tinged diarrhea may be present as can be various degrees of diarrhea and mal-digestion. Some birds may lose color in the legs and beak while others may have various feather problems. Mortality is usually low although numerous birds can be affected. This condition is usually seen between 3-6 weeks of age and is usually observed in meat type chickens.



Neurological Signs - The newest reported problem in chickens associated with a reovirus is neurological signs, which may include: incoordination, tremors, twisted necks, or twitches. The affected flocks have also had signs of arthritis/tenosynovitis and malabsorption. The condition has been reported in broiler breeder replacement pullets in the United States. In Europe a new reovirus was isolated which caused neurological signs when injected into Specific Pathogen Free Leghorn chickens.

DIAGNOSIS AND PREVENTION

Viral arthritis can be diagnosed presumptively by signs and lesions. Microscopic examination of the tendons and tendon sheaths, serological testing, or virus isolation can also be used. Mal-absorption is usually diagnosed based on clinical signs or virus isolation. These diseases can be prevented by vaccination. Since the virus can be carried mechanically it is important to utilize good biosecurity and cleaning/disinfection protocols to assist in prevention exposure of flocks. Fortunately, vaccination programs in breeder birds have helped to reduce the incidence of this disease in progeny. As new isolates are found, research efforts to provide better more efficacious vaccines are continuing.

Avian reoviruses are widespread in nature and are known to cause viral arthritis and mal-absorption / pale bird syndrome.

SUMMARY

Avian reoviruses are widespread in nature and are known to cause viral arthritis and mal-absorption / pale bird syndrome. However, recent field reports have associated the virus with neurological signs. Vaccination of breeder birds as well as strict biosecurity procedures can effectively reduce the effects of reoviruses on commercial poultry flocks.

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Water Intake: A Good Measure of Broiler Performance

Introduction

Raising broilers has its share of aggravations, not the least of which is never knowing how the flock is performing until after the flock is sold and the check shows up. Of course, by this time a new flock may already be in the houses and it is much too late to do anything about the old flock. Growers can use daily mortality patterns throughout the flock and visual appraisals to get a general idea of what's going on, but this is a very subjective measure of performance. Dependable bird and bin scales are commercially available that allow growers to monitor daily feed intake and weight gains. Unfortunately, because of the expense these scales are out of the question for most producers. However, there is a reliable way to accurately measure flock performance that you may already have or can gain access at relatively little expense. Monitoring water consumption on a daily basis has been shown to be a reliable measure of broiler performance.

Are You Delivering Enough Water?

Water is the most important nutrient consumed by an animal. A bird can survive several weeks without food, but only a few short days without water. Broilers drink a great deal of water. During its lifetime, a 5-pound (2.3-kg) broiler will consume about 18 pounds (8.2-kg) of water, compared to approximately 10 pounds of feed (Lacy, 2002). Pesti and coworkers (1985) estimated the daily water consumption of broilers by multiplying the age of the bird in days by 0.2 ounces. For example, a 10-day old bird will drink about 2 ounces of water during a 24-hr period while a 60-day old bird will drink 12 ounces (or about 355 ml). While it is good to know how much water birds require, it is also important to be sure that water is delivered to your birds. Nearly every grower has houses with nipple watering systems and every grower should have one nipple per 10 to 12 birds at 5 weeks of age. However, Lott and coworkers (2003) have recently found that nipples with low flow rates can decrease flock performance. These workers found that adequate flow rates (in ml/minute) could be estimated by multiplying 7 ml times bird age in weeks and adding 20. So, adequate nipple flow rates for 4-week old birds would be 7 x 4= 28 + 20 = 48 ml/min. Delivering

Water is the most important nutrient consumed by an animal. A bird can survive several weeks without food, but only a few short days without water.

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MORE water than the birds need is not a problem, but delivering less can reduce performance.

Water Consumption is Correlated with Feed Consumption

A critical fact that producers may not be aware of is that feed and water consumption are very closely related. Lott and coworkers (2003) estimate the correlation between feed and water consumption at 0.98. In short, this means that when water consumption changes 98% of the time feed consumption changes. Because of this fact, if we accurately monitor daily water consumption, we can get a very good idea of daily feed consumption. Figure 1 shows daily feed and water consumption patterns for a 56-day flock of male broilers at the Applied Broiler Research Unit. We recorded water in gallons per 1000 birds using our water meters and feed in pounds per 1000 birds as measured by our feed bin scales. As would be expected, both feed and water intake increase over the 56-day period, but intake becomes somewhat more erratic after day 35. However, notice that when there is an increase or decrease in feed or water consumption, there is a corresponding increase or decrease in the other. We can use this close correlation to our advantage when assessing flock performance. If water intake is down on any given day, most likely feed intake is also down on that day. If water intake is up, feed intake is most likely up. Notice also that on the days water intake is down, that day is usually followed by an up day. It is rare for water intake to be down two or more days in a row unless some type of problem is present. Perhaps the flock is getting sick or you ran iodine or bleach that changed the taste of the water. Regardless, if you monitor water intake and it is down two or more days in a row, start looking for a problem because something most likely is wrong. You may wonder if this same feed and water consumption pattern holds true across time or over numerous flocks and the answer is yes, but keep in mind that during summer months when hot weather is a constant challenge to attempts to keep birds cool, the ratio of water to feed will increase somewhat as birds drink additional water in to cool themselves.

Tips on Monitoring Water Consumption

One important fact to remember when you monitor water consumption using water meters is to make sure you read the meter at the same time each day. This procedure will assure that you have accurate 24-hour consumption records. Pick a time to read the meter that is convenient for you and stick to it. Some of the more advanced controllers on new or remodeled houses have the capability to read the water meter for you if programmed to do so. Even if your controller cannot do this, it only takes a few seconds to record the meter reading with pencil and paper during one of your regular house checks. Once you have this type data collected over several flocks, you can begin to compare flocks against each other. Save your records and/or build a database on your home computer that will allow you to quickly access past flocks to compare with your current flock. Most likely, flocks where you settled near the top of the list will have greater consumption of both feed and water than those flocks where you were average or below. Label your records so that you know how you performed on each flock and this can help you quickly assess the status of your current flock at any time during the grow-out period.

Peak Water Consumption Times and Amounts

Some additional information that you may find useful is when, during the day, water consumption is at its peak. This information is important when sizing well pumps and supply lines from the water source to the chicken house. Installation of too small diameter pipe in conjunction with a long run from the water source to the chicken house will result in a loss of water pressure by the time water reaches the chicken house. If the pressure drop is great enough, it will be difficult to maintain an adequate supply of water to the birds and cooling systems, especially during times of peak demand. Data in Table 1 were collected at the Applied Broiler Research Unit on a late summer-early fall flock (August-October) of 56-day old male broilers. Although the data were collected several times per hour, the data were condensed to total weekly consumption to save space. It is important to understand that water intake for the times listed include that water consumed during the previous one hour (i.e., 7:00am includes water consumed from 6:00 am-7:00am; 5:00pm includes water consumed from 4:00pm-5:00pm, etc.). Our research indicates that peak demand is in the morning, not the afternoon, even though you might think birds would drink the most during the hottest part of the day. Peak demand usually occurs shortly after sunrise or shortly after the lights come on if the lighting program has kept the birds in the dark several hours prior to sunrise. During the period from day 13-27, peak demand was at the 8:00am hour and during this time the lighting program kept the birds in the dark from shortly after midnight until sunrise. Only a small amount of water was consumed at the 7:00am reading because it was too dark for birds to see to drink until after 7:00am. However, from day 35 until harvest, birds received very little darkness at night and the peak demand time moved to the 9:00am and 10:00am readings. During the 13-27 day period, the birds were thirsty at sunrise and drank before eating. Later on, during the day 35 until harvest period, birds were free to eat and drink most of the night and at sunrise, as light intensity increased, bird activity also increased but they tended to eat first and drink later. Highest peak demand was recorded on day 55 during the 8:00am-9:00am hour at 5.55 gals per 1000 birds. Water consumption in the afternoon hours, especially later in the flock, never approached morning usage amounts. Keep in mind, however, that even though water intake by the birds is less in the afternoon, during hot weather fogging and cool cell systems are putting added demands on well pumps and supply lines. Failure to provide adequate size well pumps or supply lines of the proper diameter can seriously reduce water flow to the poultry house to the point that water intake by the birds will be restricted, and therefore, feed intake and growth rate will also be restricted. When remodeling or retrofitting, be aware that you may need to install a bigger pump or larger supply lines to provide an adequate water supply. Make sure supply lines from the water source to the chicken house are large enough to prevent a huge pressure drop before water reaches the chicken house.

Summary

Monitoring daily water consumption is a reliable measure of broiler performance and is much less expensive than bird or feed bin scales. Feed and water consumption are very closely correlated so that if you know water intake you can closely estimate feed intake. Water meters are fairly inexpensive and when used properly can be an excellent management tool. The key is to read the meter at the same time every day. Keep a record of water intake throughout the flock and, after several flocks, you will have a database of information you can use to compare the performance of your current flock against past flocks. In this manner, performance could be monitored on a daily basis or break flocks into weeks and compare performance on a weekly basis. A weekly basis may be somewhat more advantageous because it will average out some of the variability that can occur on a day-to-day basis. Be aware of the peak water demand at your farm and make sure you have adequate pump capacity and piping diameter to more than meet this demand. Remember that restricting water intake will also restrict feed intake and bird performance.

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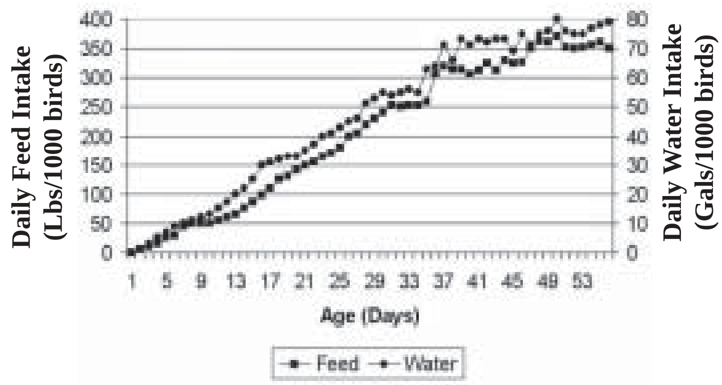
Correlation of Broiler Feed and Water Intake*



* Adapted from 1992 Annual Report.

Table 1. Peak Water Demand Times and Amounts for Male Broilers[1]

Flock Age (Weeks)	Morning Hours 7:00 am	8:00 am	9:00 am	10:00 am	Afternoon Hours 2:00 pm	3:00 pm	4:00 pm	5:00 pm
1	1.61	2.79	3.83	4.12	2.75	2.75	2.78	2.98
2	5.35	13.77	10.80	10.57	7.47	7.87	8.50	8.48
3	6.26	25.43	16.16	14.36	12.57	12.41	12.65	12.96
4	16.33	22.75	18.23	18.48	17.08	14.41	17.28	17.11
5	15.39	28.52	28.00	26.93	21.05	18.22	21.25	21.36
6	20.87	30.35	31.46	29.94	23.44	19.50	23.09	23.66
7	21.71	27.05	30.82	31.27	24.37	20.53	22.90	23.90
8	19.34	23.53	26.50	23.88	20.56	18.25	18.98	18.80

[1] Adapted from 1992 Annual Report

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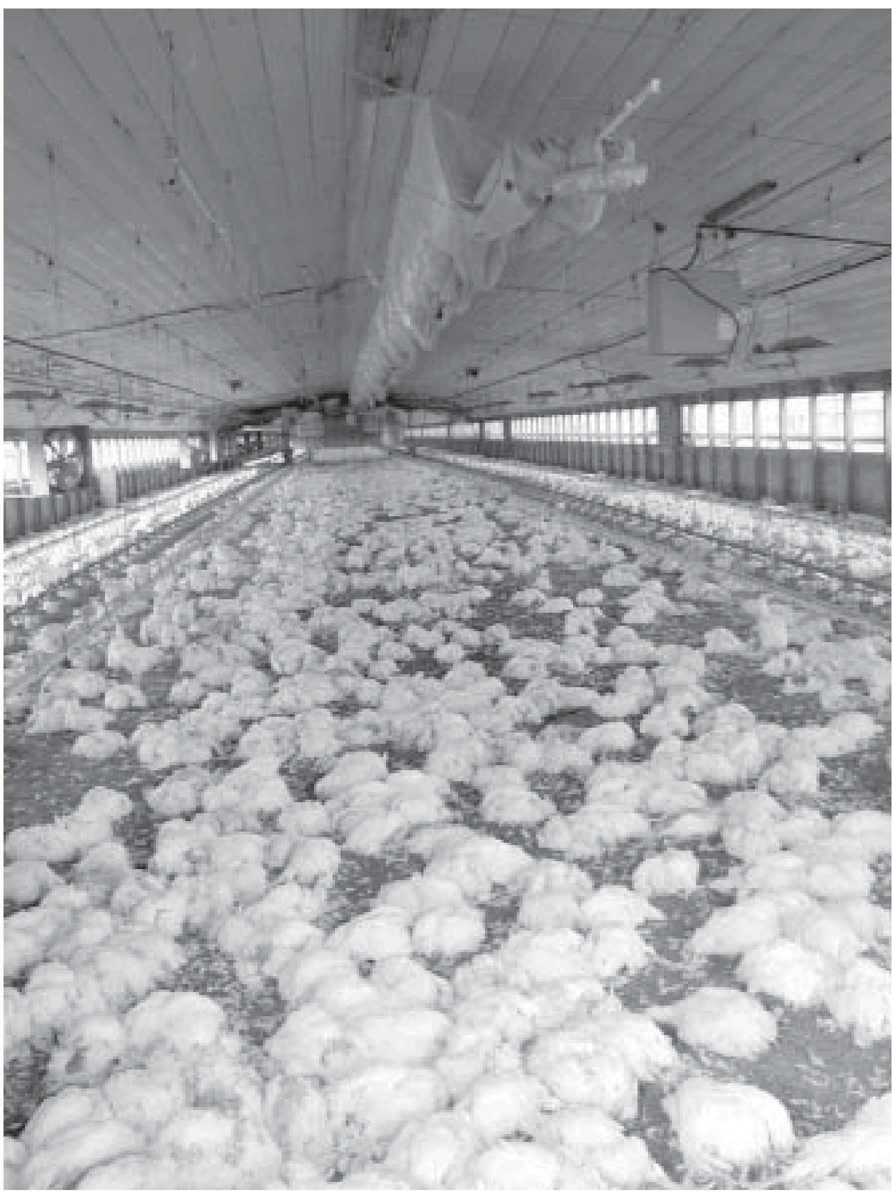
Exotic Poultry Diseases -- An Update

Introduction

Eradication costs associated with exotic poultry disease outbreaks in the United States typically run about $1 million per day of the outbreak and these diseases have the potential to cripple or destroy the industry. Two diseases, Exotic Newcastle (END) and Avian Influenza (AI), are listed on the Office of International Epizootics "A" list of reportable diseases. Outbreaks of both of these diseases have occurred recently in the United States. In addition, an Avian Influenza outbreak has recently occurred in Europe. Therefore, it would appear that an update is in order.



Exotic Newcastle

Exotic Newcastle disease was confirmed in the United States in California on October 1, 2002. The disease was present in a gamefowl flock in the Los Angeles area. The disease spread in Southern California and to two other states, Nevada and Arizona. In California, the disease involved backyard birds, hobby flocks, gamefowl and commercial table egg chickens. A total of 920 premises were positive for END in California. A total of 18,427 premises were quarantined. The number of commercial premises quarantined in the END outbreak was 22.

An outbreak of END was also reported in Nevada on January 16, 2003 and in Arizona on February 4, 2003. The virus in these outbreaks was the same strain as the END virus in California. In Nevada a total of 155 premises were quarantined with 10 premises positive for END. In Arizona 67 premises were quarantined and only 1 premise was positive. No commercial birds were affected in the outbreaks in Nevada and Arizona.

An outbreak of END was also found in El Paso, Texas on April 9, 2003, but this virus was a different strain than the California virus. A total of 497 premises were quarantined in Texas with only 1 premise positive for END. A federal quarantine was also placed on 2 counties in New Mexico. No commercial birds were affected in the Texas END outbreak.

The disease has been eradicated in Nevada, Arizona, and Texas. No new positives have been seen in California since May 31, 2003. The cost of eradication is still to be determined, but trade costs impacts have been estimated to be over $77 million in direct trade costs and over $74 million in indirect trade costs. A total of 3, 923,678 birds were depopulated in California to date. The numbers of birds depopulated in the other states are as follows: 2,746 in Nevada, 269 in Arizona, and 1,871 in Texas. Most of the federal quarantines in all states except California have been lifted and authorities are working in California to lift the quarantines as soon as possible.

Exotic poultry diseases have the potential to cripple or destroy the industry. Since exotic poultry diseases are continually present worldwide, vigilance and biosecurity are necessary to prevent a devastating outbreak in the poultry industry.

Avian Influenza

High Pathogenic Avian Influenza (HPAI) was confirmed in the Netherlands on March 31, 2003. This was the first case of HPAI ever reported in that country. Massive eradication and clean-up procedures were undertaken and the last positive case was reported on May 23, 2003. A total of 255 farms were found to be infected with HPAI and approximately 27 million birds were depopulated during the outbreak. All poultry exports were banned from the Netherlands during the outbreak.

The HPAI outbreak in the Netherlands spread to Belgium with HPAI confirmed in Belgium on April 18, 2003. This outbreak was also Belgium's first ever recorded HPAI. Like the Netherlands, Belgium undertook extensive containment and control measures. The last positive case in Belgium was reported on April 28, 2003 and restrictive measures except for surveillance were lifted on June 12, 2003.

HPAI was also confirmed in Germany on May 13, 2003. Only one premise was affected. Control measures for the disease in Germany were lifted on June 25, 2003. The outbreaks in Europe are considered over with only surveillance efforts still in place in the affected countries. It is estimated that 30 million birds were depopulated during the outbreaks with 90% of these in the Netherlands.

Low Path Avian Influenza (LPAI) was diagnosed on March 5, 2003, on a table egg farm in Connecticut. The virus was identified as H7N2 similar to the type in the Virginia outbreak in 2002. Two Connecticut poultry facilities are currently under quarantine. Both of the facilities are multi-house, multi-age egg layer operations and are located near Lebanon and Bozrah, Connecticut. The number of birds under quarantine is approximately 4.7 million. Surveillance efforts are being conducted in the New England states to check for possible spread of the disease. Swab samples taken in April in Rhode Island were positive for H7N2 virus similar to LPAI found in the live bird markets of the Northeast. The premise sampled in Rhode Island is under state quarantine and surveillance is continuing. Most LPAI strains cause few (if any) clinical signs in infected birds; however, some strains are capable of mutating into HPAI.

Summary

Exotic poultry diseases have the potential to cripple or destroy the industry. Since exotic poultry diseases are continually present worldwide, vigilance and biosecurity are necessary to prevent a devastating outbreak in the poultry industry.

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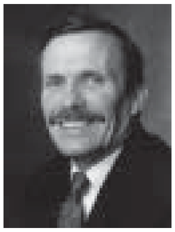

Dr. Frank Jones, Extension Section Leader, received his B.S. from the University of Florida and earned his M.S. and Ph.D. degrees from the University of Kentucky. Following completion of his degrees Dr. Jones developed a feed quality assurance extension program which assisted poultry companies with the economical production of high quality feeds at North Carolina State University. His research interests include pre-harvest food safety, poultry feed production, prevention of mycotoxin contamination in poultry feeds and the efficient processing and cooling of commercial eggs. Dr. Jones joined the Center of Excellence in Poultry Science as Extension Section Leader in 1997. Telephone: 479-575-5443, FAX: 479-575-8775, E-mail: ftjones@uark.edu

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Dr. Susan Watkins, Extension Poultry Specialist, received her B.S., M.S. and Ph.D. from the University of Arkansas. She served as a quality control supervisor and field service person for Mahard Egg Farm in Prosper, Texas, and became an Extension Poultry Specialist in 1996. Dr. Watkins has focused on bird nutrition and management issues. She has worked to identify economical alternative sources of bedding material for the poultry industry and has evaluated litter treatments for improving the environment of the bird. Research areas also include evaluation of feed additives and feed ingredients on the performance of birds. She also is the departmental coordinator of the internship program.
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Mr. Jerry Wooley, Extension Poultry Specialist, served as a county 4-H agent for Conway County and County Extension Agent Agriculture Community Development Leader in Crawford County before assuming his present position. He has major responsibility in the Arkansas Youth Poultry Program and helps young people, parents, 4-H leaders and teachers to become aware of the opportunities in poultry science at the U of A and the integrated poultry industry. He helps compile annual figures of the state's poultry production by counties and serves as the superintendent of poultry at the Arkansas State Fair. Mr. Wooley is chairman of the 4-H Broiler show and the BBQ activity at the annual Arkansas Poultry Festival.
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