NC STATE UNIVERSITY

North Carolina Cooperative Extension Service

North Carolina Poultry Industry Newsletter

Department of Poultry Science
234 D Scott Hall, Box 7608, NCSU

Raleigh, NC 27695-7608
Telephone: 919-515-5407
Fax: 919-515-7070
Website: http://www.ces.ncsu.edu/depts/poulsci/

Volume I, Issue II
Issue Editor: Kathy Bunton, Area Specialized Agent
Issue Layout: Jane Duncan, Extension Secretary

ALTERNATIVE LITTER MATERIALS FOR GROWING POULTRY

Jesse L. Grimes, Extension Turkey Specialist

Poultry litter is a mixture of excreta, feed, feathers, and bedding material. However, we also generally refer to both new and unused bedding materials as litter. As the poultry industry in the US has grown and expanded, the availability of litter materials has been challenged. Historically, there are many factors which successful litter management must take into account such as type of litter, time of the year, depth of the litter, floor space per bird, feeding practices, disease, kind of floor, ventilation, watering devices, litter amendments, and even fertilizer value. Many types of litter have been used for litter during the early days of the poultry industry including straw, corn cobs, corn stalks, sugar cane stalks, peat moss, peanut hulls, wood shavings, oat hulls and several others. However, litter type can significantly affect carcass quality and bird performance. This article discusses litter types, both from a view of past efforts and what is currently being used or what is under research or development.

Most poultry are grown on dirt floors with some type of bedding material; although, there has been some interest in brooding turkeys in cages, growing broilers to market in cages, and growing broilers and turkeys to market on raised floors. In many areas of the country, shavings from pine or other soft woods have historically been the bedding of choice for poultry production. Other materials also have a history of use as a bedding material such as rice hulls utilized in the lower Mississippi River poultry production areas of Arkansas and Mississippi. Several factors help determine if a material is a good bedding source. In general, a bedding material needs to be very absorbent. This is probably a good criterion for organic materials but might not apply to inorganic materials such as polystyrene, sand, or clay. In addition to being absorbent, the litter material must have a reasonable drying time. Many paper products absorb moisture but do not dry out appropriately. Another criterion is that the material should have a useful purpose once it has been used as a bedding material. If not, poultry growers would accumulate un-manageable quantities of old litter. On-farm observations of large accumulations of litter stored unused for long periods of time have not been uncommon. This is not acceptable even on a small scale and would be non-sustainable on an industry-wide scale. Historically, post-bedding uses have included land application for crops or pastures, potting material for the greenhouse and plant container industries, or feed for cattle.

However, as other post-bedding uses such as electrical co-generation and gasification programs are developed, materials for bedding may not have to meet the narrow post-bedding criteria currently imposed. Poultry bedding materials also have to be reasonably available. Some materials may meet industry goals once under the birds but if it is difficult to obtain, for whatever reason, it will not find favor as a poultry litter. Finally, if a material is not cost competitive with current materials utilized, it will also not be used as a litter material. However, if the new material has increased value once removed from the poultry house compared to current litters or if the current litter material itself becomes difficult to obtain or the quality is decreases, poultry growers may decide to use the new litter material. Of course any bedding material must not be toxic to poultry or to poultry growers. The effect on other livestock, pets, wildlife, and even plants must also be considered. Poultry can consume as much as 4% of their diet as litter. Therefore, any bedding must also not contain any contaminants, such as pesticides or metals, which might be consumed by the bird due to litter eating or other bird behavior. In addition, contaminants could cause the meat or rendered products to become unusable.

As noted above pine shavings has been the bedding of choice because of performance, availability, and cost. Other bedding materials are usually compared to pine shavings as they are examined for possible use as litter material. Eleven potential litter materials were used in one study: pine shavings, pine sawdust, pine bark, bark and chips, pine stump chips, pine straw, chopped pine straw, rice hulls, peanut hulls, ground corn cobs, and clay. All the litter materials were tested for eight physical properties including bulk density, moisture holding capacity, and drying rate. Results of the bulk density test were interesting in that it was shown before use there was a great range in density from 2.3 lbs/ft^3 for pine straw to 35.9 lbs/ft^3 for clay with pine shavings at 6.1 and sawdust at 13.2 lbs/ft^3, respectively. However, after use with three flocks of broilers, the range in density decreased with densities ranging from 17 lbs/ft^3 for rice hulls to 26 lbs/ft^3 for pine bark (clay was not tested after usage). After all testing, the authors ranked the litter materials as follows from best to worst: pine shavings, rice hulls, corn cobs, stump chips, pine sawdust, bark & chips, pine bark, and clay. Pine straw (long and chopped) and peanut

This Issue Includes:

North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

ALTERNATIVE LITTER MATERIALS FOR GROWING POULTRY

(continued from page 1)

hulls were not include in the final ranking. Pine straw was found to be especially lacking in that it caked over quickly. It would be interesting to apply this same testing to newer materials. However, while bird performance is the ultimate test for a litter material, availability and cost also have a big impact when deciding which litter material to use. These are also two major reasons producers and researchers are interested in alternatives to pine shavings as bedding materials. Re-utilization of a stored, coarse litter fraction as a supplement for fresh wood shavings bedding in broiler houses was found to not significantly increase pathogens and indicator microorganisms in litter compared to that of wood shavings. Initial litter microorganisms were higher in fresh litter than in wood shavings or stored litter, but there were no consistent significant differences found during re-utilization. Deep stacking of litter, which is an incomplete composting process, can eliminate *E. coli* and *Salmonella* providing that the internal stack temperature reaches 140 to 160° F. Re-spreading the stacked litter and allowing it to dry would be expected to extend litter life. Some broiler producers are simply removing cake and excess litter after house washing and then placing broilers on old litter for an extended number of flocks. Their expectation is that total clean out is not needed unless there some disease or other bio-security issues. However, producers doing this should be aware that total dis-infection under these conditions is probably not possible.

The use of sawdust has emerged based on the decline in the quality and availability of pine shavings. As the quality of pine shavings declines, the amount of sawdust in the shavings usually increases. In many cases, the switch from shavings to sawdust has occurred without input, and in some cases in spite of input, from poultry growers or the poultry industry as a whole. For broiler production, sawdust has generally received a satisfactory grade. Many producers are resigned to using sawdust because it is available from shavings suppliers and is cost competitive. In many cases it is the only litter material available. In addition, broilers usually perform well although there are some incidences of litter consumption. While it is usually possible, and desirable, to avoid hardwood shavings, hardwood sawdust mixed in with softwood sawdust is difficult to avoid or to even detect. In many areas of the country, growers are rearing their birds two or more years prior to clean out. After one or two flocks, many people cannot differentiate between originally based sawdust and pine shavings. For turkey poult brooding, however, sawdust is not desirable because poults are more prone to litter consumption and are more susceptible to contracting aspergillosis from wood products, especially sawdust, compared to broiler chickens. However, in many cases, turkey growers are using sawdust, or pine shavings that closely resemble sawdust, because other materials are not available, including good quality pine shavings.

There are a number of wood based materials that have been examined for use as poultry bedding. However, breast blisters can be significantly increased for the broilers reared on wood chips. Wood pallets used in the warehouse and trucking industries have also been examined for use as a poultry bedding material. Shredded pallets have been compared to pine shavings and sawdust with reportedly acceptable broiler performance, good litter moisture holding capacity, an acceptable level of fines, and low levels of chemical contamination which should combine to make this a material suitable for poultry bedding purposes. A substantial amount of hardwood bark is generated as a by-product by the wood industry. There have been several efforts to use bark or bark products as broiler bedding in research and field trials, again with acceptable results. However, bark litter with particles sizes greater than one inch can result in more litter cake. In addition, particle size, moisture content (and, therefore, mold content) and the amount of wood splinters in bark can be major concerns for bark.

Contacts for the North Carolina Poultry Industry Newsletter

On-Campus Contact
Brian W. Sheldon, Ph.D., Dept Extension Leader
Dept of Poultry Science, NCSU
www.ces.ncsu.edu/depts/poulsci/
email: brian_sheldon@ncsu.edu
telephone: 919-515-5407

Field Faculty Contacts
Kathy Bunton, Area Specialized Agent, Poultry
*Iredell, Wilkes and Alexander Counties
www.ces.ncsu.edu/iredell/
email: kathy_bunton@ncsu.edu
telephone: 704-878-3154
Dan Campeau, Area Specialized Agent, Poultry
*Chatham, Harnett, Lee, Moore and Randolph Counties
www.ces.ncsu.edu/chatham/
email: dan_campeau@ncsu.edu
telephone: 919-542-8202
James Cochran, Area Specialized Agent, Poultry
Bladen, Columbus, Cumberland, Hoke and *Robeson Counties
www.ces.ncsu.edu/robeson/
email: james_cochran@ncsu.edu
telephone: 910-671-3276
James Parsons, Area Specialized Agent, Poultry
*Duplin, Sampson and Wayne Counties
www.ces.ncsu.edu/duplin/
email: james_parsons@ncsu.edu
telephone: 910-296-2143
Jody Smith, Area Specialized Agent, Poultry
Anson, Cabarrus, Montgomery, Richmond, Scotland, Stanly and *Union Counties
www.ces.ncsu.edu/union/
email: jody_smith@ncsu.edu
telephone: 704-283-3743
*(*Administratively housed in this county.)*

North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

ALTERNATIVE LITTER MATERIALS FOR GROWING POULTRY

(continued from page 2)

Rice hulls basically fall into the same category as pine shavings in that they work well and are readily available in certain areas of the country. Broilers and turkeys reared on rice hulls generally perform as well as broilers reared on pine shavings and that rice hulls are usually as easy to manage as shavings. Rice hulls can be mixed with pine shavings or used alone. However, ground rice hulls have been reported to cake over and adhere to the toes of turkey poults. This was associated with an increase in poult mortality; however, after about three to four weeks of age the birds began to scratch the litter breaking up the cake. However, birds with trimmed toes or no toenails might have a problem breaking up any cake. Rice hull ash is also receiving some attention as a litter material and has been used to rear broilers in a research setting. This material has a granular consistency and is mostly silicon dioxide (60%) and carbon (35%) and, therefore, has a black sooty appearance. This resulted in some black discoloration of feathers, shanks, and feet. However, there was no problem with carcass quality as all of the black material was removed during processing. As with the timber industry and pine shavings, the rice industry is finding more profitable avenues for rice hulls other than usage as poultry litter.

Bagase (cane pomace) is the ground pith and fiber by-product of sugar cane production after sugar extraction. It is highly absorbent but has been described as having a tendency to cake easily in one case while in another report it is characterized as drying readily. Bagase has been reported to have greater moisture initially compared to shavings but that the bagase dried to a lower moisture level than shavings after only one flock of broilers. As with most litters, management is very important. Heating during cool weather and adequate air flow during warm weather will facilitate the drying of many litter materials.

Straw refers to any grass stubble material such as from barley, Bermuda grass, flax, oat, wheat, or rye, etc. However, wheat straw is by far the most commonly used as a litter material. There are several reports concerning its successful use a litter material. It has been described as difficult to manage and prone to caking. However, straw is being used successfully on a commercial basis in several areas of the country. Work at Oregon State University resulted in research and field trials using chopped grass straw as a broiler litter. Poultry producer recommendations on the use of straw included:

- straw should be chopped to one inch or less,
- straw is best used as a top dressing over old litter,
- 1000 lbs of straw over old litter saved 15 ft^3 of sawdust,
- chopped grass straw is a very effective litter material,
- straw is cheaper than sawdust,
- growers may need to run more gas brooder time to keep straw dry,
- length of straw is more important than type of straw,
- if the straw is too long it will bridge (mat over) quicker,
- pay back on using straw is quick.

This is a good example of a readily available by-product providing satisfactory poultry performance that proved to be more economically viable than the current litter material. Straw is also being used successfully for commercial turkey production. The best performance for the straw is when it is used half & half with shavings, rice hulls or brooder house litter. It is a common practice in turkey production to move starter or brooder house litter into the grow-out house. In this operation, straw is not used in the brooder house. Investigators have also found that turkey hens had equal body weight and feed conversions when reared on chopped hay compared to those reared on pine shavings. There have been numerous other plant by-products tested as litter material including corn cobs, kenaf core, coca bean shells, cotton by-products, corn stalks, citrus pulp, peanut hulls, soybean stalks, and wheat bran. While many of these materials can perform to various levels of satisfaction most have not received large scale commercial adoption for use as litter. The exception would be peanut hulls. Peanuts hulls can be managed as a satisfactory litter material and are used in regions of the U.S. where peanuts are grown.

Recycled paper products may continue to grow as a source for poultry litter as interest in recycling waste streams continues and tipping fees for landfill disposal continue to increase. Several products such as processed paper, processed newspaper, processed cardboard, recycled paper, shredded newspaper, and chopped newspaper have been used as alternative bedding materials. These recycled paper products that are being utilized are cheap and readily available, which make them an economical source of bedding for the poultry industry. Considering reports that the use of some paper products result in high litter moisture and caking levels which can, in turn, result in increased breast blisters or other carcass defects, it has been suggested that paper-based products might be most practical when used as a top dressing or mixed with other conventional wood-based beddings.

Sand as a litter material is not new to poultry production yet it is receiving renewed interests, especially in the southern U.S. Alabama researchers have reported successfully rearing several broiler flocks on sand compared to pine shavings. In multiple tests, broilers reared on sand performed as well as those reared on pine shavings. Foot pad quality and male broiler body weights were improved when reared on sand in some cases. Moisture and ammonia levels were similar to pine shavings with significantly lower levels of bacteria in the sand litter compared to shavings. Darkling beetle populations are reduced with sand litter. However, sand does not heat up as well in winter or as quickly in summer or winter compared to shavings litter. This requires more attention from the producer to make sure the floor temperature is correct before chicks are placed. Houses with space heaters tend to be more of a problem than houses equipped with traditional brooders, although the problem still will exist even with brooders. Most of the work with sand has been done in the southern U.S. and one can speculate that this effect of cooler floors may be more problematic for northern locations. In addition, it may be

North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

ALTERNATIVE LITTER MATERIALS FOR GROWING POULTRY

(continued from page 3)

advised that the use of sand as a litter material begin during the summer rather than fall to facilitate the initial drying of the sand and to gain some experience in pre-heating the sand floor in preparation for the incoming chicks. While this is a noteworthy area of caution for starting chicks, it can be a benefit for older birds in warm or hot weather. The cooler floor temperature can act as a heat sink helping the birds during hot weather. Another potential advantage with sand is a longer time period before clean-out. If litter is removed every one or two years, sand offers an advantage because the clean-out can be stretched up to five years with sand. However, as the time that litter is kept in houses increases, which in some areas is already up to four or five years, this advantage decreases. As noted, some growers no longer plan for a total clean regardless of litter material, including sand, as long as flocks remain healthy. Growers using sand also wash the house once birds are marketed, the cake litter is removed thoroughly, sand added if needed, and then houses are set up for the next group of birds. However, this practice is not universal and may or may not prove to be practical. Certainly, sand litter would have to be totally removed in cases of disease out-breaks or if performance shows signs of a drop-off. Sand is currently under review in several areas of the country other than the south with mixed results. While broiler performance has been or better, in some cases, than for broilers reared on litter, other issues raised included poorer chick starts on sand compared to shavings and dustier air conditions. Other issues raised include that sand used as litter is not cost effective for all farms, the economics of using sand may depend on location of sand versus the farm, and sand is not compatible with composting, combustion, or pelleting. Continued field trials will help determine the best management guidelines for using sand as litter. Sand has been tried in North Carolina as a broiler litter but has not gained wide use.

Recycled sheetrock, peat moss, clay and clay products, and recycled rubber (tire chips) have all been reported to be an alternative for bedding with various results. Other alternative litter materials for poultry will continue to be researched and evaluated. Comparisons to pine shavings or sawdust will probably continue as the benchmark test. However, while bird performance will always be a threshold criterion, cost and availability will ultimately determine the adoption of a new or alternative litter material by poultry growers and the poultry industry.

IMPROVING BIOSECURITY ON POULTRY FARMS

James Parsons, Area Specialized Agent

Poultry farmers constantly have biosecurity drilled into their heads from service representatives, veterinarians, Extension personnel and other sources. As a poultry farmer you may get tired of hearing about biosecurity, but please do not relax your biosceurity program. I think the following information will justify the importance of a sound biosecurity program.

Exotic Newcastle Disease, Avian Influenza, and other highly transmissable diseases are a very real disease threat to poultry farmers in North Carolina. You as a poultry farmer, must do everything you can to help reduce the risk of disease outbreaks on your farm.

Last year, California and other western states had to deal with Exotic Newcastle Disease. Although, the disease has been eradicated and all quarantines have been lifted, you should not relax your biosecurity program.

The Exotic Newcastel Disease outbreak and eradication process to humanely euthanize and depopulate 2,138 premises (mostly backyard flocks) housing 3,016,000 birds cost taxpayers more than $160 MILLION. Imagine what the cost would be if Exotic Newcastle Disease or any foreign animal disease North Carolina. I hope these figures got your attention.

Dr. David Rives, veterinarian with Prestage Farms, presented an outstanding talked titled “Improving Biosecurity on Turkey Farms” in October, 2003, at the NC Turkey Industry Days meeting. The basic steps he outlined that <u>any</u> poultry farmer should take to improve biosecurity at the farm level are:

MAKE IT DIFFICULT FOR UNNECESSARY VISITORS TO ENTER YOUR FARM. Install a gate. Post signs alerting visitors of disease risk. Keep doors locked.

MAKE IT EASY FOR ESSENTIAL VISITORS TO ENTER YOUR FARM. Provide a vehicle wash station. Make disposable boots and other items such as hairnets and coveralls available.

AVOID CONTACT WITH OTHER POULTRY. This seems obvious, but how many growers have someone working on their farm who may have contact with “backyard” birds?

MAINTAIN THE PUMP HOUSE AS A “CLEAN” AREA
The pump house is often a source of cross-contamination between houses, especially on two-age farms. Treat it like a separate house to minimize this problem.

PROVIDE A MEANS OF SANITIZING BOOTS BETWEEN HOUSES. Dip pans can work, but are seldom maintained properly. A hose and siphon valve can be easier to maintain and be more effective. Having separate boots for each house is also an option.

HAVE CLOTHING STRICTLY DEDICATED TO FARM USE. It is a little extra trouble, but going to lunch at the local grill and then re-entering poultry houses increases the chance of disease introduction.

North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

IMPROVING BIOSECURITY ON POULTRY FARMS

(continued from page 4)

MAINTAIN A VIGILANT PEST CONTROL PROGRAM. This is a constant battle. Take whatever steps are necessary to keep fly and beetle numbers at a minimum. Keep rodent bait available and rotate when necessary. Keep wire and side walls in good repair. Install a hot wire around houses to deter varmints. When houses are empty, keep end doors or summer doors closed when not tilling or cleaning out.

INSPECT VEHICLES AND EQUIPMENT COMING ONTO THE FARM. Cleanout crews and others who go from farm to farm, including company personnel, are a very real disease threat. Provide a means for cleanup or deny them entry to the farm.

DRINKING WATER QUALITY FOR POULTRY

Kathy Bunton, Area Specialized Agent, Poultry

Poultry drinking water is often taken for granted. Many poultry farmers think that as long as water is available to their birds, everything is fine. This is not necessarily so. Water quality is extremely important to bird health and is involved in every aspect of poultry's metabolism. Water softens the feed in the crop and forms a carrier for feed during its passage through the digestive tract and aids in digestion and absorption. Water helps birds remove waste, lubricate their joints and cools body temperature as it evaporates through the lungs and air sacs. It can also be a useful tool in monitoring flock health. Since feed and water consumption are so closely related, a sudden drop in one is a good indicator of a drop in the consumption of the other and is often the first indication of a problem in the flock.

Quality and quantity of water must be maintained to ensure birds reach their maximum growth potential. Quantity of water is a major consideration. Baby chicks are 85 percent water, adults are 55-60 percent and eggs are 66 percent water. Even a 10 percent loss of water can cause serious physiological disorders and a 20 percent loss can lead to death. Because of this, maintaining an adequate supply of quality drinking water to the birds at all times is essential. There must be enough water available to at least satisfy the demands of the birds at extremely high temperatures.

Quality of drinking water is a major consideration because if birds are drinking large quantities of poor quality water, then they are consuming large amounts of contaminants. The characteristics of safe, good quality drinking water for poultry is often complex. Water can be and should be tested on a regular basis. It can be tested for bacteria and other microbes, for naturally occurring minerals, and for other chemical and physical properties.

The NCDA & CS Agronomic Division can test water for such properties as nitrate level, sodium, pH, and hardness to name a few. The charge for this analysis is $4.00 per sample. Private laboratories can also analyze water but may charge a higher fee. The NCDA & CS Agronomic Division can not test for bacteria in the water. Private laboratories can be used for this analysis but the fee may be expensive. County Health Departments can analyze samples for bacteria at an average cost of $25.00 per sample. However, the policy or procedure varies from county to county so you should contact your local county Health Department.

In general, when collecting water samples for testing you should run the water for several minutes to flush the water line. The outlet should then be sterilized by flaming or other suitable methods. The sample should be placed in a sterilized container and sent to the testing laboratory within 24 hours for bacteria analysis.

North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.