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## **UTILIZATION OF TURKEY WASTE MATERIAL IN BEEF CATTLE DIETS**

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### **INTRODUCTION**

Beef cattle are well adapted to consuming a wide range of feedstuffs. This is primarily due to a digestive system which contains a rumen. This is a large fermentation chamber containing large populations of microbes. They have the ability to break down and digest highly fibrous feeds, releasing waste products that can be utilized by the host animal to meet nutrient requirements.

The microbes are also able to utilize low quality feeds (Eg. crude protein) and by-product type feeds. One such by-product feed that is available to beef producers in the central part of Utah is turkey waste material.

### **TURKEY WASTE AS A FEED**

The turkey industry in Utah is centered primarily in Sanpete County with an estimated 5,000,000 turkeys grown annually. Waste from these operations is approximately 100,000 tons (wet) on an annual basis. Presently much of this waste is either spread back on the land or stock-piled by producers who are not aware of its value as a feedstuff for beef cattle.

Turkey waste material is the residue left on the floor of the barn after the turkey is shipped to market. It is an accumulation of shavings, turkey fecal droppings and feed waste.

Turkey grower and finisher diets are balanced for energy, protein, vitamins and minerals, and nutritionists take great care to ensure they are included in the proper amounts. Rations do not normally vary in actual feed ingredients or nutrient specifications because producers generally feed proven diets to ensure optimum days to market. When consuming these diets the turkeys spill some onto the floor and it mixes in with the fecal droppings. Overall, this is a small percentage of the turkey waste material but it improves the nutrient composition.

The litter is mostly pine or aspen shavings, sawdust or wood chips. The percent of the bedding material will depend on how many groups of turkeys have been raised since the last time turkey waste material was removed.

## NUTRIENT SPECIFICATIONS OF TURKEY WASTE MATERIAL

Turkey waste nutrient specifications will vary depending on a number of factors such as concentration of turkeys in a barn, amount and type of litter base used and amount of feed displaced from the feeders. This variation in final product can be a problem in deciding where turkey waste may be fed. In most cases however it should be used as a supplement to an existing ration.

Table 1 is an example of a nutrient analysis that was conducted from stock-piled turkey waste in Sanpete County in the spring of the year.

**Table 1. Nutrient Analysis of Turkey Waste Material**

<b>Nutrient</b>	<b>Nutrient Level (Dry Matter Basis)</b>
Dry Matter (%)	89.1
Protein (%)	24.0
TDN (%)	50 - 60
ADF (%)	28.1
Calcium (%)	2.88
Phosphorus (%)	1.68
Potassium (%)	1.89
Magnesium (%)	.49
Sulfur (%)	.37
Sodium (mg/kg)	2265
Cobalt (mg/kg)	1.9
Copper (mg/kg)	370
Manganese (mg/kg)	300
Zinc (mg/kg)	356

The above analysis is from turkey waste that had been stock-piled in the open for a number of weeks. This is necessary to aid in the drying process which also reduces handling and feeding problems. However, the initial moisture content is quite low coming out of the barns so there is usually little concern for moldy turkey waste.

The temperature and moisture conditions at the time of “barn clean-out” are factors which will determine the amount of ammonia loss and decomposition. Analysis demonstrates that turkey waste is relatively high in protein content although approximately half of the total protein present in turkey waste is true protein while the other half is in the form of nonprotein nitrogen (NPN) materials. Ruminants (microbes in the rumen) however have the ability to synthesize natural protein from NPN which can be utilized by the animal, provided adequate energy is available in the ration. Uric acid is the main NPN constituent and accounts for approximately 30 % of the nitrogen, with ammonia making up approximately 14 % of the total nitrogen. The high protein content is a major reason turkey waste should be considered as a supplemental feed source for beef cattle.

There are characteristics of turkey waste that could affect palatability. Turkey waste usually contains fine particles and has the pungent odor of uric acid and ammonia. However, beef producers that feed turkey waste to their cattle attest that these characteristics do not appear to be a problem.

Published reports suggest that turkey waste is moderate to low in energy and consequently may not contribute significantly in this regard and should not replace other feedstuffs as a method to supplement energy. However the energy derived from turkey waste is an extra benefit and may help maintain or promote animal condition and production.

The mineral content of turkey waste is also relatively high but can vary considerably. The factors mentioned previously (base litter and waste feed as a percentage of the total mix) are potential sources of variation. There is a broad tolerance level by beef cattle for the majority of the minerals and thus a relatively low potential for toxicity due to over consumption of turkey waste. Most Utah soils, and resultant plant material, are relatively low in most of the macro and micro minerals such as magnesium, cobalt, copper, manganese and zinc. Supplementation of these minerals is generally required by all classes of beef cattle, and the use of turkey waste could be beneficial in meeting mineral requirements.

Turkey waste can be of substantial benefit for lactating beef cows because the phosphorus requirement of the cow increases significantly after calving. Roughage sources are relatively low in phosphorus, and supplementation of turkey waste during this critical period may benefit beef cattle where roughage is the principle feedstuff.

## **SUGGESTED SUPPLEMENTAL USES OF TURKEY WASTE IN BEEF CATTLE DIETS**

Turkey waste is relatively high in protein (Table 1). Therefore, to utilize turkey waste for maximum benefit it should be fed in diets where protein may be limiting. This could include beef cows under maintenance conditions that are consuming low-quality roughage (straw or poor quality grass hay) or during lactation when the protein requirement is highest (Table 2). It could also be fed as a protein supplement to beef cows or stocker cattle on pasture when the forage begins to mature as the summer progresses.

Growing cattle can also benefit from turkey waste because they have a relatively high protein requirement. In growing rations palatability is a concern because it is important to maximize dry matter intake. For finishing cattle, little or no supplemental protein is generally required (depending on feedstuffs used). However research on finishing feedlot steers has shown that broiler litter can substitute for a portion of the diet and feed efficiencies are still similar to those animals not fed the litter. This could decrease the cost of gain considerably if the litter was valued below other ration ingredients.

Examples where turkey waste may be fed to beef cattle are included in Table 2. It is important to recognize the nutrient requirements of the animal being considered in any feeding program. Matching these requirements with available feedstuffs is the first step to ration formulation. After developing a ration for a particular animal type if requirements are not met then a supplement should be considered. Factors to consider are ease of feeding or mixing, availability and economics.

Wintering beef cows can consume up to 10 lbs per day of turkey waste, where turkey waste access is not limited. This would have to be accounted for in a ration to determine the amounts of other feedstuffs to include. Some animals may exceed this level, while others may consume less. This variability makes ration formulation difficult. There will be animals in the herd that may never consume

turkey waste or only minimal amounts. Cow condition scoring is important to ensure that the energy status is maintained in the herd.

In Sanpete County some producers have made a silage out of turkey waste, which seems to be more palatable than the dry form. Moisture levels of 35 % were targeted, however, moisture levels of 28-35 % produce good results as well. There are no nutrient specifications available for ensiled turkey waste.

**Table 2. Examples of Turkey Waste in Beef Cattle Diets**  
Feedstuff (lbs/day)

Animal Type <sup>1</sup>	Grass Hay	Corn Silage	Barley Grain	Turkey Waste
Beef Cow - 1200 lb (Maintenance) <sup>2</sup>	25			3
Beef Cow - 1200 lb (Lactating) <sup>2</sup>	29			3
Growing steer - 500 lb (2.0 lb ADG)		20	5	2

<sup>1</sup> Additional allowances for vitamins A, D and E need to be included in the rations. No mineral supplementation is required other than salt.

<sup>2</sup> Turkey waste in this example is substituted for a portion of the hay to meet the energy requirement. It also provided all of the essential minerals, including phosphorus, decreasing the cost of the ration.

## ANIMAL HEALTH

Many tons of litter have been fed to cattle with few health problems. But there are potential problems and precautions that should be taken if turkey litter is being considered in beef cattle diets.

Because poultry can shed pathogens, such as salmonella, it is recommended that before feeding the litter should be stacked, covered with plastic, and allowed to heat for at least 3 weeks. It should be stacked from 6 to 12 feet high and contain 70-80% dry matter. The internal temperature should reach 130 degrees F to eliminate most pathogens and improve palatability. Covering the stack with plastic will help prevent overheating (above 160 degrees F) that can reduce the nutritional value of the protein in the feed. If a shorter heating time is used then a higher temperature (160 F) is needed to eliminate pathogens. The ammonia present in litter also aids in protecting against pathogen survival.

Producer testimonials indicate that they have lost a few animals to unknown causes when turkey waste has been fed. Necropsies have not been conducted so actual cause of death is unknown and therefore cannot be directly attributed to feeding turkey waste. Veterinarians suggest, however, that cows be kept current on their eight-way vaccinations.

**Salmonella**— research has shown that heating to 130 F for 3 weeks was sufficient to kill this bacteria in a deep-stack. A variety of salmonella may be present in litter.

**E. coli O157:H7**— this pathogen has been isolated from cattle but not from poultry litter. However, a flock could contract this organism and present a potential problem to cattle and human health. The deep-stack heating treatment will greatly reduce the presence of this pathogen in the litter and is an important safe-guard.

**Pesticide residues** — some pesticides may be used in poultry houses and can potentially cause residue problems in cattle that ingest the litter. However, poultry producers must also avoid any pesticide residues in the birds and usually use a product that is safe and has a minimal withdrawal time. Communication with the poultry producer and records of any pesticides used can help to avoid this potential problem.

**Foreign objects** —hardware and broken glass can be present in litter and cause problems for cattle. Planning ahead with the poultry producer may help to avoid most of this type of problem.

**Heavy metal residues** — cattle fed litter have had increased levels of copper and arsenic in the liver. The copper content is not of concern for human health. The arsenic levels returned to normal within a few days after withdrawal prior to slaughter. A 15-day withdrawal period should provide an adequate level of safety.

**Botulism** —is a threat if decaying carcasses are present in the litter or if the litter is rotting. A number of outbreaks have occurred in Israel so they routinely vaccinate cattle which are to be fed litter. The feeding of litter was banned in Australia because of some massive feedlot occurrence. A number of incidents have occurred in the United States, from the feeding of litter and other contaminated or spoiled forages. The removal of birds from the housing as they die and the deep-stack heating should help reduce this potential problem but may not eliminate it completely.

## SUMMARY

Producers have found that cattle readily accept feed turkey waste. It appears that most producers are feeding from 3 to 5 pounds per day in troughs or on the ground although it could be mixed into complete as well. Turkey waste is even stock piled in pastures and cattle have free access to it. It is suggested, however, that turkey waste be fed and supplemented in a more controlled manner. Economics of feeding can be positive as producers view turkey waste as a by-product and generally assign no value to it. However, turkey waste should be valued at a price at least equal to the cost of nutrients (nitrogen, phosphorus and potassium) that would be available if it were used as a fertilizer source when spread on the land. Turkey waste is recognized as being a valuable fertilizer and therefore would have to be reasonably priced for consideration as a livestock supplement.

Feed is the single largest operating cost of any cattle operation and it is always advantageous to keep feed costs low without negatively affecting production. When considering the use of turkey waste as a feed, consult with a qualified nutritionist who can assist you in determining where it may fit into a feeding program. Feed testing is also required to determine what nutrients may be available in turkey waste.

It is important to consider the animal health factors that have been outlined in this paper before feeding turkey waste. One should consult with extension personnel or a veterinarian if additional information is desired.

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