



Characterization of poultry manure – 1

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Discovery Farms has investigated the potential for nutrients to move from headland stacks into waters of the state (surface or groundwater). A headland stack is a pile of manure stored on bare soil at the edge of a crop field until the field is ready for manure application. Headland stacks remain in place for weeks or months, or up to one year. Stacking, while not unique to poultry manure, is common in the industry because of this manure's high dry matter content. Stacking is also common on farms that haul daily or clean livestock lots, or on farms with stackable manure.

This brief contains information on the characteristics of poultry manure, including nutrient concentrations, water holding capacity and infiltration rates – how fast water flows through a pile. Several years of concentration data was evaluated, and the averages were compared to Wisconsin book values to determine if recommendations are adequately estimating the nutrient availability for poultry manure.

Nutrient concentrations

Poultry manure is generally more consistent in terms of nutrient concentrations than manure from other species of livestock. With few exceptions, most of the analyses of nutrient concentrations for poultry manure were very similar. It is reasonable to use “book values” to credit all sources of poultry manure. Producers and agency personnel that pay close attention to application rates and timing can feel confident that book value nutrient credits are correct.

Water holding capacity

People in the industry often talk about litter's ability to absorb high levels of rain without running off. This part of the study evaluated poultry manure's ability to hold water. The manure used had been stacked on an asphalt pad for at least six months. Pad manure was chosen for this study and the infiltration rate trial because decomposition minimizes water holding capacity and represents the lowest capacity of all manure types.

Water holding capacity was calculated by running water through a 4-inch wide PVC column (Figure 1) packed with poultry litter. A filter system was attached at the bottom of each column to trap sediments, simulating actual field conditions. This was used to reduce impediments to water leaving the column while allowing manure to retain as much water as possible. Early tests verified the filter's ability to capture sediments and allow water to flow freely.

Four feet of manure was placed on top of the filter system, followed by a layer of glass beads to decrease channelization. Six liters of water were forced through the columns while maintaining one foot of head pressure. Columns remained in place until all water dripped from each column. Manure was weighed before and after saturation, which was verified visually and by adding additional water. The fourth column had an extra 1,000 ml of extra water added to the system, and virtually all the additional water flowed through.

Table 1 (page 2) shows the results of this study. Of the 6,000 ml of water poured into the first three columns, each column retained almost exactly the same amount of water. Column 4 received 7,000 ml of water in order to verify that the manure reached a saturated state. This study showed that poultry manure has excellent



Figure 1. Determining water holding capacity

water holding capacity. One pound of poultry manure holds about 230 ml of water, or one ton of poultry manure can hold approximately 730 lbs of water.

Water infiltration rate

How fast water moves through manure is important in determining the potential for nutrients to leach through a

Table 1. PVC Column Data

	Column 1	Column 2	Column 3	Column 4
Dry Manure Weight (lbs)	11.94	12.25	12.19	11.69
Water In (ml)	6000	6000	6000	7000
Water Out (ml)	3250	3200	3190	4250
Wet Manure Weight (lbs)	16.44	16.56	16.50	16.13
Column Flow Time (sec)	540	490	510	660
Column Flow Rate (sec/in)	11.25	10.21	10.63	13.75
Water Holding Capacity (% by wt)	37.69	35.18	35.36	37.98

stack on bare soil. Water flowed through the manure columns at an average rate of 11.46 seconds per inch of manure. In order to achieve these flow rates, 6,000 ml of water was placed on the columns, creating about one foot of head pressure, which would not happen in the field. In comparison, it would take about a 36-inch rainfall to equal the equivalent amount of water used in this study. This water was forced through each column in six minutes. A rain event of this proportion would cause

environmental challenges much greater than the loss of nutrients from a pile of manure. Finally, the manure was placed on top of a glass fiber and sand filter system. These filters enhanced water infiltration to a rate more rapid than field conditions provide.



Conclusions

- ❑ Poultry manure has less variation in nutrient concentration than most other types of livestock manure and appears to be more predictable than dairy or swine manure.
- ❑ Season has little effect on nutrient content for manure coming out of poultry barns.
- ❑ Poultry manure holds tremendous amounts of water – 37 percent of its weight as water. Therefore, most rainfall events would be absorbed by a headland stack and not run off.
- ❑ Infiltration of water into litter is moderately rapid. The rate under extreme conditions averaged 11.46 seconds per inch; however, these conditions are unlikely under field conditions.
- ❑ The tendency for poultry manure (or similar manure) to hold large amounts of water suggests that headland stacking of this material has limited surface water and groundwater pollution potential.