Controlling Silage Leachate

Rebecca Mitchell, Dann Bolinger, and Natalie Rector
Michigan State University Extension Agents
July 2002

Silage leachate, or seepage from silage piles in bags, bunkers, or silos is a typical occurrence on dairy farms. In Michigan's most recent approved guidelines for a comprehensive nutrient management plan (CNMP), silage leachate is identified among manure and milkhouse wastewater on the list of farm outputs requiring proper management.

Why such concern over silage leachate? From an environmental standpoint, leachate presents a problem when it flows into surface waters. Silage leachate has an extremely high biochemical oxygen demand (BOD). This means that leachate has a very high potential for oxygen consumption and when discharged into surface water, can remove so much oxygen that fish and other aquatic creatures die immediately. As little as one gallon of silage effluent can lower the oxygen content of 10,000 gallons of river water to a critical level for fish survival.

Silage leachate also contains nutrients that can harm groundwater; the most critical being nitrate-nitrogen. In addition, the acidic nature of silage leachate can burn or kill vegetation in the area where it drains. Farmers can opt to capture silage leachate by constructing lined ponds or collection basins. Such structures must meet prescribed setbacks from existing wells and surface water and are generally costly to construct. Systems can also be engineered which decrease the volume of material to be handled by collecting only the concentrated wastes while diverting the low-concentrated wastes to a designed grass filter area.

Once captured, leachate could be pumped or directed into an existing manure or milkhouse wastewater storage. However, this could contribute a significant amount of volume to the storage, particularly when rainwater runoff from a bunker is collected. Moreover, since leachate produces dangerous hydrogen sulfide when mixed with liquid manure, it should only be considered in well-ventilated, outdoor storages.

As an alternative to costly structures to catch silage leachate, farmers can and should make efforts to minimize silage leachate production. Fortunately, many of the recommended practices for harvesting and storing the highest quality silage go hand in hand with minimizing silage leachate.

One of the most critical determinants of corn silage quality and leachate production is harvest moisture. For bunker silos, corn silage should be harvested between 65% and 70% moisture (35% and 30% dry matter). Moisture levels may be even lower for corn silage stored in upright silos, though it should not fall below 62% moisture. A range of 60 to 70% moisture (30 to 40% dry matter) is optimal for alfalfa haylage harvest.

Silage harvested at higher than prescribed moisture levels produces substantially more leachate. Leachate removes nutrients, particularly soluble nitrogen and

carbohydrates, and can corrode the silo. In addition, silage harvested at higher than prescribed moistures tends to have a higher prevalence of *Clostridia* bacteria. Such bacteria produce butyric acid which can reduce animal intake and forage available protein levels.

Covering the silage is another important management practice for minimizing leachate. Not only do covers preserve forage quality by minimizing air flow into the pile, they also reduce leachate production by preventing rainfall from penetrating the silage and solublizing nutrients. A plastic covering secured with tires is one common approach to protect forage quality. Research at Kansas State University shows that covering a bunker silo with plastic can return $8 in reduced forage losses for every $1 spent. Additionally, from an animal performance standpoint, covering a bunker preserves feed value and improves palatability.

Plastic covers should be applied such that rainwater and snow melt is channeled *off* of the forage pile. The all too common practice of simply diverting water to the walls of the bunker should be avoided since water penetrating silage along the walls of the bunker will still result in a leachate problem. Maintenance of plastic also needs consideration; any holes that are punctured in the covering of a silo or bag should be repaired immediately.

Though the flow of silage leachate will be greatest during the first month following storage, leachate will occur in smaller amounts throughout the feed-out period particularly when rainfall has access to the pile. The loading area should be clean of spilled silage. This is as simple as scraping spilled feed back into the pile. Silage that is not cleaned off of the loading area could wash offsite with rainwater and when wet, will continue to produce silage leachate. Divert rain water away from silage storage whenever possible. Keeping open faces vertical will also minimize contact with rainwater and reduce spoilage. An emergency backup plan should be developed for those years when high moisture silage is unavoidable. Temporary runoff containment measures could be used, such as using sawdust to absorb and stop silage leachate runoff. The sawdust could then be collected and applied to fields.

Although heightened awareness of silage leachate and runoff is necessary at harvest time, it poses a serious environmental risk year round. As responsible stewards of the environment, all producers need to be aware of the risk of silage leachate and take appropriate steps to reduce and manage it. If you would like further assistance in assessing your particular silage leachate management situation, seek assistance from one or more of the following resource persons: MSU Extension Dairy or Livestock Agents, your county USDA Natural Resource Conservationist, or a qualified engineering consultant.