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Warm-Season Grasses Limit Odors at Livestock Barns

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The following is from Gerald May, Michigan State University Extension educator; Wendy Powers, MSU director of environmental stewardship for animal agriculture; and John Durling, director of the NRCS Rose Lake Plant Material Center.

Odors from livestock facilities are an ongoing concern for both the livestock producer and the farm's rural neighbors. Odor control technologies are available, but to be widely accepted and implemented on farms, odor-reducing practices need to meet three criteria:

· The technology should be research-based with the effectiveness of the practice well-documented.

· Once installed, the odor technology should require minimal daily maintenance.

· Installation and daily maintenance should have a nominal effect on the cost of production.

Vegetative buffers, such as rows of trees and bushes, have attracted the interest of both livestock farm owners and university researchers. Because they are relatively inexpensive to plant and almost maintenance-free once established, vegetative buffers are planted by livestock farmers to enhance the landscape and reduce odor.

Vegetative buffers capture odor-bearing dust particles and mix and disperse odorous air. Using a combination of alternating rows of hybrid poplars, viburnum and red cedar to establish a vegetative buffer 30 to 40 feet from swine finishing barns, a 2011 research team led by David Parker at USDA-ARS reported a 66 percent reduction in odor concentration 50 feet downwind from the vegetative buffer, compared with a control site of similar size, management, topography and weather conditions.

At greater distances from the odor source—492 feet and 984 feet—the researchers reported

no differences between the odor levels of the vegetative buffer site and the site without vegetative buffers. They did note that contribution of odor from the earthen storages that were not in a path to benefit from the vegetative buffer at either test site, coupled with the low concentration of odor at greater distances, made it difficult to detect accurately the effectiveness of the vegetative buffers farther from the odor source.

In an effort to expand the options of plants considered for vegetative buffers, Michigan State University Extension partnered with the Natural Resources and Conservation Service Rose Lake Plant Materials Center and H & H Farms of Vicksburg, in the spring of 2013 to demonstrate the use of tall, warm-season grasses as vegetative buffers for the ventilated air from swine barn pit fans.

The intent of this demonstration was to determine if warm-season grasses could be established and would thrive near the discharge of swine barn fans and the constant exposure to dust, ammonia, hydrogen sulfide and other air emissions. A subsequent goal, if the grasses continue to grow and thrive, is to measure the odor reduction provided by the vegetative buffers.

Four species of grass were incorporated in the demonstration plots: giant miscanthus (Miscanthus giganteus), Indiangrass (Sorghastrum nutans), switchgrass (Panicum virgatum) and coastal panicgrass (Panicum amarum). These warm-season grass buffers were established using transplants started in a greenhouse at the Rose Lake Plant Materials Center (East Lansing, Michigan).

Each buffer is approximately 3 feet wide by 15 feet long and was placed 15 feet from the discharge point of the pit fan at each of four 1,000-head swine finishing barns. In total, 16 buffers were established.

Eight of the buffers contained three transplants of each of the four grass species. These plantings were made to provide the opportunity for side-by-side comparison of the survivability and growth of each species.

Four of the buffers contain 12 giant miscanthus transplants, and four contain 12 switchgrass transplants. The plantings containing just one species will provide the opportunity to measure the vegetative buffer impact on odor and air emissions.

Weeds were controlled during the summer of 2013, and the vegetative buffers were watered weekly throughout the summers of 2013 and 2014. Once fully established, the hardiness of the grasses is expected to allow them to survive and grow without watering during the summer months.

The results of the four warm-season grasses planted together in the eight buffers to provide side-by-side comparison are provided in Table 1. Giant miscanthus and switchgrass had the highest rate of first-year transplant survivability. After two seasons of growth, giant miscanthus had the most vegetative growth and was the tallest. Coastal panicgrass was the most difficult of the four species to establish. Using the two years of data on survivability and overall robustness (including height), we rank

the species as follows: giant miscanthus, switchgrass, Indiangrass and coastal panicgrass.

The practice of using tall, warm-season grasses as vegetative buffers near livestock facilities, if proven successful in reducing air emissions, offers unique opportunities. Grasses can be grown close to buildings without concern that roots may damage underground services or the manure pit integrity. Though they must regrow each spring, grasses reach their mature height relatively quickly compared with slower growing trees or bushes.

Plans for these vegetative buffers include continuing to observe each year's regrowth of the various species and monitoring the warm-season grasses as an odor control practice once additional funding is available. For more information on this subject contact me at mayg@anr.msu.edu.

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