MSU

Pork Quarterly

Vol. 15 No. 2 "Information for an Industry on the Move" August 2010

Evaluation of three commercial mycotoxin inhibitors added to vomitoxin contaminated corn diets for weanling pigs

Condensed from the July 19, 2010 report of Don Mahan and the NCCC-042, S-1044, and NCERA-89 Regional Committees on Swine Nutrition and Management. Michigan State University committee members are Gretchen Hill and Dale Rozeboom.

Summary

A regional study involving 12 university experiment stations using a total of 904 weanling pigs in 27 replicates evaluated three commercial mycotoxin inhibitors added to two different vomitoxin (DON) contaminated corn sources. The first corn analyzed 2.0 ppm DON while the second analyzed 7.0 ppm DON. The complete diet, mixed and provided in meal form from one mixing facility, was calculated to contain 1.0 and 3.9 ppm DON, respectively. The companies that produced these mycotoxin inhibitors were asked to recommend their level of product (Defusion®, Integral®, Biofix®) to be added to the diets. The study was blinded from participating companies and investigators to prevent bias. The test period was conducted after a 10 day adjustment period to a common diet. The test period that evaluated these mycotoxin inhibitors was conducted from 10 to 31 day post weaning. The results showed that the high DON corn diet reduced performance responses more severely than diets with low DON contamination. Defusion®, added at 10 lb per ton was the most effective mycotoxin inhibitor in our study in both corn sources while the other mycotoxin inhibitors were ineffective. Lighter weight pigs were more severely affected by the DON contaminated diets than pigs of a heavier body weight, but both weight groups responded positively to Defusion®. It is questionable if the feeding of a low DON contaminated corn would justify the added expense of the product while it was beneficial when DON was at a high level.

Introduction

Vomitoxin consumption has been reported to result in reduced feed intakes, reduce body weight gains, and sub-clinical immune suppression. High levels of vomitoxin may produce intestinal lesions, vomiting, and complete feed refusal.

At the regional swine nutrition meeting in January 2010, the North Central Coordinating Committee on Swine Nutrition (NCCC-042) recognized the extensive vomitoxin (DON) contamination present in much of the 2009 corn crop in the United States. The contamination was also found to be high in corn by-products such as dried distillers grains with solubles. The problem was presented to other regional committees (S-1044 and NCERA-89) who had similar concerns. A combination of investigators from these three groups evaluated how our committees could help the swine producer overcome the DON problem and how to best continue feeding this year's corn crop, particularly since there were no proven mycotoxin inhibitors on the market. It was reported

What's in this Issue...

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Funded by Animal Initiative Coalition Grant Program

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ANIMAL AGRICULTURE INITIATIVE

that many pigs completely refused to eat diets containing these DON contaminated corn sources which ultimately could have serious implications on animal health, welfare issues, and economic returns for the swine producer.

Fortunately most of the DON contaminated corn in the U.S was not at a level that seemed to affect cattle or poultry while swine appeared to be the most sensitive to the mycotoxin. Unfortunately, there were no FDA approved mycotoxin inhibitor products available, but there were some products on the market that were reported to be of benefit. However, they were not studied or reported in the literature within the public domain. It was decided to conduct a joint regional project to evaluate three of the major products available, and to share the results with the farm and feed community as quickly as possible. The goal was to evaluate the mycotoxin inhibitor products as to their effectiveness, and how we would recommend feeding the remainder of this year's corn crop. Our desire was to not only complete the study rapidly but also to report the results widely in lay publications for potential use by the swine and feed industry.

Procedures

Corn from three sources was purchased with different DON levels for conducting the project. The first source was the cleanest source of corn (DON = 1.9 ppm) available. This corn source was fed during the pretrial period for an approximate 10 day period in order to allow the weanling pigs to get started on a common diet (without any mycotoxin inhibitor added) and to overcome the normal post weaning lag in growth and feed intake. The other two corn sources used in the subsequent test diets analyzed 2.0 ppm or 7.0 ppm DON, the former source analyzing somewhat lower than expected.

The pretest diet was fed for approximately 10 days and was comprised of dietary feedstuffs normally fed in a phase 1 diet to weanling pigs. Test diets during the following 21 day test period were formulated to utilize as much corn in the diets as possible in order to best test the efficacy of the three selected mycotoxin inhibitor products. Only one diet was fed from the 10 to 31 day period for each treatment group.

All cooperating stations fed the same pretest diet, used the same corn sources, and used the same diet mixtures (including the pretest diet), mixed at one location (Wooster, OH) and transported to each cooperating station in early February 2010. All diets were formulated to meet or exceed current NRC (1998) swine nutrient requirements. Although the products were mixed in some cases a few weeks prior to being fed, most of the studies were done shortly after the diets arrived at the various universities.

The three products evaluated were from the following organizations: BioMin (Biofix Plus®), Akey (Defusion®), and Alltech (Integral®). The companies were contacted when the project protocol was being written and they all agreed to have their products evaluated. The three products incorporated into the test diets (Defusion®. Integral®, and Biofix Plus®, were added at the expense of corn starch to maintain the same nutrient profile of the remaining dietary constituents. The three commercial mycotoxin inhibitor products were purchased on the open market to ensure that the companies would not be accused of preparing special products for this trial. Each contributing company was given the opportunity to evaluate the corn mycotoxin assay results, the diet formulas that the products were to be added, and to recommend the incorporation level of their product into the test diets with the two corn sources. The amount of products added to the 1.0 ppm diets were (Defusion® 10 lb/ton; Integral 4 lb /ton and Biofix Plus® 8 lb/ ton), while the amount suggested for the 3.9 ppm diets were (Defusion® 10 lb/ton; Integral 6 lb/ton; and Biofix Plus® 8 lb/ton). In addition, the treatment and product identification was blinded not only to the company but also to the investigators. Each investigator was asked to collect performance data but to also evaluate other signs, denoting the date and reasons why pigs might be removed from the study. At the completion of the study, each company and investigator was again given the opportunity to review the final results without knowing which treatment represented specific products. All of this was done to ensure that bias would not enter into the conduct of the trial or data interpretation.

A short explanation of the products and how each product might function in reducing the effects of DON follows:

***Biofix* Plus®** (Bio Min) contains yeast cell wall, natural microbials, and diatomaceous earth (clay) which may be effective in reducing DON and other mycotoxins.

Defusion® (Akey) is a blend of preservatives, antioxidants, amino acids, and direct-fed microbials which is thought to decrease some of the toxic effects of vomitoxin in pigs.

Integral® (Alltech) is a yeast cell wall that has been modified and may serve as an adsorbent of dietary mycotoxins.

Pig gain and feed intake performance criteria were the measurement traits evaluated in this study. The completed trial data was statistically analyzed using conventional SAS analysis of variance procedures. Although pigs were allotted on initial body weight at weaning they were fed a common diet for an approximate 10 day period. Consequently, the weights at the beginning of the test period differed slightly. Thus the 10 day weights were adjusted by covariate analysis (to use a common initial weight within replicate from 10 to 31 day) to ensure that the responses were not affected by differences in weight at the beginning of the test period.

Results

The complete set of data from all stations involving all replicates is reported in Table 1. There were 12 stations that conducted the trial involving a total of 27 replicates and 904 pigs. Some replicates contained pigs of an initially lighter or heavier weight at weaning. Therefore six of the lighter weaning weight and seven replicates of the heaviest weight were analyzed independently to see if there were different initial weight responses to the DON contaminated corn sources and the various mycotoxin inhibitors.

The pretest diet fed for an approximate 10 day period resulted in good performance responses, but two pigs were removed before the product evaluation test period started. Their removal was due to unthriftiness and loss of body weight. In general, the pretest diet that contained a low innate level of DON (0.80 ppm) did not appear to affect pig gains or feed intakes.

Feeding the treatment test diets (days 10 to 31 post weaning) clearly resulted in different performance responses to the two different corn sources. Pigs consuming the 7.0 ppm DON corn (diet calculated at 3.9 ppm DON) had reduced pig body weight gains and feed intakes each week of the test period compared to the corn that tested 2.0 ppm DON (diet calculated 1.0 ppm DON). Unfortunately we did not have access to corn without DON contamination and could not make a comparison to such corn. There was no incidence of feed refusal for either of the two test corn sources, but feed intake was reduced when the higher DON contaminated corn was fed. There were a total of five pigs removed from the study. Although unthriftiness of pigs was generally recognized throughout the study it was not severe enough to remove pigs from the trial. Of those pigs removed, the prevailing observation was a decline in body weight, limb immobility, and pneumonia. There was evidence of swollen vulvas when pigs consumed the 3.9 ppm DON diet but this was probably reflective of zearalenone contamination not DON. There was no reported incidence or evidence of intestinal hemorrhages which would be indicative of T-2 Toxin. As expected, the major negative response from DON contamination appeared to result in reduced gain, reduced feed intake, and a general unthriftiness, the latter response was most likely because of the low feed intake.

For the low Don contaminated corn only Defusion® proved to be effective by increasing pig gains and feed intakes during week 1 and 3 of the test period over that of the negative control diet. The effect of the other mycotoxin inhibitors to the diets was statistically similar to the negative control. The overall growth rate and feed intake did not, however, differ significantly for most of the trial for two of the three mycotoxin inhibitors products, but there was an apparent numerical advantage to Defusion®. Although this level of DON is reported to be tolerated by the young pig, our results would indicate that its additional expense to diet cost may not be

cost effective when a low level (≤ 1 ppm) of DON is fed to weanling pigs.
In contrast, when the high DON corn diets (calculated at 3.9 ppm DON) were fed those pigs consuming the diet with Defusion® weighed more at the end of the trial, gained more weight and consumed more feed during each week of the trial than those fed the control or Integral or Biofix Plus® mycotoxin inhibitors.

When pigs were evaluated by weaning weight groups they responded to the two corn sources and mycotoxin inhibitor products somewhat differently. The results of the lighter weight pig group (Table 2) indicated that their response to the DON contaminated corn source was more pronounced than the heavier pig group (Table 3). In the light weight group there was a clear benefit to Defusion for both DON contaminated corn sources, whereas there was no response to the other two products. The benefits of Defusion® were evident during the initial week of the test period and continued throughout the remainder of the trial. In the heavier pig group the same general trends occurred but the results were not as dramatic as when the lower DON contaminated corn source was fed. Again with the higher DON contaminated corn, Defusion® still proved to be the superior mycotoxin inhibitor in both growth rate and feed intake during each week of the trial.

Discussion

Although Defusion was superior in our trial, the corn used in these treatment diets was primarily contaminated with DON and not the other Fusarium molds. How the other mycotoxin inhibitor products used in our study would respond with corn that also contained zearalenone, T-2 Toxin or aflatoxin is unknown. It is unusual that corn mycotoxins are predominated by a single mycotoxin and in some cases the other products might be effective against the other mycotoxins. Because Defusion® was also added at a high level, it is not known what a lower dietary inclusion level would produce. There are several lessons and recommendations that we can make from this study.

1. It is important to analyze for the various mycotoxins present in corn sources or their by-products when fed to swine. The "quick test" done by most elevators is a good starting point for determining the amount of contamination but these tests are not completely reliable and highly variable. Once a large quantity of corn is stored it is a good idea to test the entire bin (several probes) and be analyzed by a recognized laboratory using modern techniques. Be sure to test at various sites in the bin so as not to isolate a "hot spot". Mycotoxin contaminated grains seem to accumulate along the outer edge and in the center of the storage facility.
2. The mycotoxin inhibitors to be used should have public research conducted or research publically presented to ensure that the claims presented are valid and unbiased. The companies being evaluated in this experiment are using this and other research findings that they are conducting to produce better products or to know how to best use their product. These companies are already in the development stage of evaluating newer products.
3. It is possible that the value of mycotoxin inhibitors may vary with different feeding or management conditions. For example we used a dry meal fed diet with weanling pigs. If a swine producer is feeding their feed with water, the enzymes in these or other products might be activated and be more effective than if fed in the dry meal form. The company would be able to address these issues with the swine producer.
4. With the current 2009 corn crop, the grain should be cleaned and fines removed prior to grinding and mixing into swine diets, as most of the mycotoxin will be located in this portion of the grain.
5. Wheat and other grains can also be contaminated during the flowering and early milk or "boot" stage. Consequently, the straw from such crops may be contaminated. There is current evidence that at least some of the current 2010 wheat crop my be contaminated with DON.
6. Stored corn should be dried to a minimum of 14% moisture and aerated frequently so that the mycotoxins will not continue to develop in the bins. When removing grain from the bin, try and remove corn in large batches so as not to isolate "hot spots".
7. Weanling pigs and reproducing animals should be fed better corns as they are more sensitive to mycotoxins and these production phases will more readily influence pig profitability. Older pigs, particularly grower finisher pigs appear to be able to tolerate higher levels of DON.
8. The use of other grains or ingredients free from mycotoxin contamination should be considered in current diet formulas. But they should be screened for mycotoxins.

Table 1. Effect of mycotoxin inhibitors added to vomitoxin (DON) contaminated corn and fed to weanling pigs

Item	Corn	Test Corn (2.0 ppm DON)				Test Corn (7.0 DON)				
	Product:	None	Defusion®	Integral®	Biofix®	None	Defusion®	Integral®	Biofix®	SEM
	Added/ton; lb.:	0	10	4	8	0	10	6	8	
	Cost/Ton, $:	0	10.00	11.60	22.32	0	10.00	17.40	22.32	
No. of replicates		27	27	27	27	27	27	27	26	-
No. of pigs		113	113	113	113	113	113	113	113	-
No. pigs removed (10-31 day)		1	2	0	0	2	0	0	0	-
Pig weight, lb.										
Weaning		14.7	14.7	14.8	14.7	14.9	14.8	14.8	15.1	0.1
Start of test, 10 d		18.6	18.7	18.8	18.5	18.6	18.8	18.4	19.4	0.2
Final weight, 31 d		39.8^{a}	41.7^{b}	39.4^{a}	39.7^{a}	34.8^{c}	39.7^{d}	34.1^{c}	33.8^{c}	0.4
Pre test period (0 – 10 d)[1]										
Dietary DON level, ppm		0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	-
ADG, lb.		0.35	0.40	0.39	0.39	0.38	0.39	0.38	0.39	0.02
ADFI, lb.		0.48	0.50	0.49	0.49	0.49	0.51	0.48	0.51	0.01
Test period (10-31 d)										
Dietary DON level, ppm		1.0	1.0	1.0	1.0	3.9	3.9	3.9	3.9	-
ADG, lb.										
10 – 17 day		0.71^{a}	0.86^{b}	0.73^{a}	0.74^{a}	0.39^{c}	0.73^{d}	0.42^{c}	0.39^{c}	0.02
17 – 24 day		1.04	1.08	0.97	0.99	0.83^{c}	1.03^{d}	0.77^{c}	0.76^{c}	0.03
24 – 31 day		1.31^{a}	1.42^{b}	1.35^{a}	1.36^{a}	1.11^{c}	1.33^{d}	1.07^{c}	1.06^{c}	0.04
10 – 31 day		1.02	1.09	0.99	1.03	0.75^{c}	1.01^{d}	0.80^{c}	0.74^{c}	0.11
ADFI										
10 – 17 day		0.99^{a}	1.13^{b}	1.01^{a}	1.07^{a,b}	0.71^{c}	0.99^{d}	0.69^{c}	0.70^{c}	0.03
17 – 24 day		1.52	1.57	1.41	1.45	1.15^{c}	1.45^{d}	1.08^{c}	1.04^{c}	0.04
24 – 31 day		1.95^{a}	2.13^{b}	1.94^{a}	1.99^{a}	1.64^{c}	1.98^{d}	1.56^{c}	1.61^{c}	0.05
10 – 31 day		1.50^{a}	1.60^{b}	1.46^{a}	1.52^{a}	1.19^{c}	1.49^{d}	1.16^{c}	1.16^{c}	0.03
Feed/Gain 10 – 31 d		1.48	1.46	1.46	1.49	1.60^{c}	1.46^{d}	1.54^{c}	1.64^{c}	0.05

$^{a, b}$ Means with different superscripts on the 1.0 ppm diet differed ($P < 0.05$).

$^{c, d}$ Means with different superscripts on the 3.9 ppm diet differed ($P < 0.05$).

[1] The pretest period involved feeding a common diet without the mycotoxin inhibitor products added. A total of 2 pigs were removed during the pre test period because of unthriftiness.

Table 2. Effect of mycotoxin inhibitor products added to vomitoxin (DON) contaminated corn fed to light weight weanling pigs

Item	Corn	Test Corn (2.0 ppm DON)				Test Corn (7.0 ppm DON)				
	Product:	None	Defusion®	Integral®	Biofix®	None	Defusion®	Integral®	Biofix®	SEM
	Added/ton; lb.:	0	10	4	8	0	10	6	8	
No. of replicates		6	6	6	6	6	6	6	6	-
No. of pigs		29	29	29	29	29	29	29	29	-
Weaning weight, lb		12.4	12.5	12.5	12.3	12.5	12.4	12.5	12.4	
Test period (10 – 31 d)										
Dietary DON level, ppm		1.0	1.0	1.0	1.0	3.9	3.9	3.9	3.9	-
Pig weight, 10 d		15.6	15.5	15.8	15.2	15.4	15.5	15.8	15.3	0.3
Final weight, 31 d		34.3^{a}	37.0^{b}	34.5^{a}	33.6^{a}	28.3^{c}	33.3^{d}	28.2^{c}	27.6^{c}	0.9
ADG, lb.										
10 – 17 day		0.60^{a}	0.78^{b}	0.60^{a}	0.66^{a}	0.32^{c}	0.60^{d}	0.31^{c}	0.29^{c}	0.03
17 – 24 day		0.87^{a}	1.06^{b}	0.87^{a}	0.89^{a}	0.62^{c}	0.88^{d}	0.65^{c}	0.60^{c}	0.05
24 – 31 day		1.23	1.31	1.18	1.13	0.94^{c}	1.12^{d}	0.95^{c}	0.88^{c}	0.04
10 – 31 day		0.88	1.00	0.87	0.89	0.60^{c}	0.87^{d}	0.62^{c}	0.60^{c}	0.04
ADFI, lb.										
10 – 17 day		0.79^{a}	0.99^{b}	0.82^{a}	0.90^{a}	0.67^{c}	0.80^{d}	0.60^{c}	0.55^{c}	0.05
17 – 24 day		1.31	1.40	1.19	1.27	0.86^{c}	1.28^{d}	0.88^{c}	0.93^{c}	0.05
24 – 31 day		1.74	1.76	1.73	1.69	1.35^{c}	1.69^{d}	1.41^{c}	1.55^{c}	0.05
10 – 31 day		1.39	1.44	1.33	1.41	1.04^{c}	1.39^{d}	1.08^{c}	1.16^{c}	0.06
Feed/gain ratio										
10 – 31 day		1.59	1.44	1.56	1.62	1.77^{c}	1.58^{d}	1.81^{c}	2.08^{e}	0.08

^{a,b} Means within the 4.0 DON corn treatment groups differed ($P < 0.05$).

$^{c, d,e}$ Means within the 7.0 DON corn treatment groups differed ($P < 0.05$).

Table 3. Effect of mycotoxin inhibitors added to vomitoxin (DON) contaminated corn and fed to heavy weight weanling pigs

Item	Corn / Product: / Added/ton; lb.:	Test Corn (2.0 ppm DON) None 0	Defusion® 10	Integral® 4	Biofix® 8	Test Corn (7.0 ppm DON) None 0	Defusion® 10	Integral® 6	Biofix® 8	SEM
No. of replicates		7	7	7	7	7	7	7	7	-
No. of pigs		33	33	33	33	33	33	33	33	-
Weaning weight, lb		17.2	17.2	17.2	17.3	17.2	17.5	17.4	17.1	
Test period (10 – 31 day)										
Dietary DON level, ppm		1.0	1.0	1.0	1.0	3.9	3.9	3.9	3.9	-
Pig weight, lb. 10 d		21.3	21.6	21.6	21.2	21.5	22.0	21.5	21.5	0.5
Final weight, lb. 31 d		45.1	46.2	44.5	44.5	39.5^c	44.5^d	39.9^c	39.3^c	1.40
ADG, lb.										
10 – 17 day		0.85	0.91	0.80	0.80	0.44^c	0.78^d	0.60^c	0.44^c	0.05
17 – 24 day		1.12	1.05	1.07	1.01	0.90^c	1.13^d	0.86^c	0.93^c	0.07
24 – 31 day		1.41	1.53	1.41	1.52	1.23	1.30	1.18	1.18	0.08
10 – 31 day		1.08	1.11	1.04	1.07	0.83^c	1.03^d	0.86^c	0.82^c	0.05
ADFI, lb.										
10 – 17 day		1.13	1.18	1.16	1.15	0.75^c	1.02^d	0.82^c	0.80^c	0.05
17 – 24 day		1.62	1.67	1.60	1.62	1.17^c	1.61^d	1.30^c	1.26^c	0.08
24 – 31 day		2.20	2.30	2.08	2.26	1.94	2.01	1.83	1.74	0.11
10 – 31 day		1.61	1.63	1.55	1.61	1.29^c	1.51^d	1.34^c	1.22^c	0.08
Feed/gain ratio										
10 – 31 day		1.46	1.48	1.50	1.49	1.53	1.48	1.47	1.50	0.03

$^{c, d}$ Means within the 7.0 DON corn treatment groups differed ($P < 0.05$).

Swine Jobs School -- Fall 2010

Opportunities for New Employees and Swine Farm Owners

Jerry May, Pork Educator, Gratiot Co., Ithaca

Recognizing the pork industry's need for skilled employees Swine Jobs School aims to provide trained individuals prepared to meet the requirements for employment on modern swine farms.

The School focuses on students who have completed high school and are looking for immediate employment or workers who are currently unemployed and looking for opportunities to re-enter the workplace. The School is also an excellent opportunity to offer additional training to recently hired swine farm employees. The program is designed to teach the skills needed to work with swine as well as teach job and interpersonal skills needed for successful employment.

Applications for Swine Jobs School, and more information on the program, are available on the Pork Team's web page at http://bit.ly/swinejobs or from any Pork Team member.

The next session of Swine Jobs School is scheduled to start on September 7, 2010. The classroom sessions of the school will be held at the Schoolcraft Township Building in Vicksburg. Sessions will run from 9:00am to 4:00pm daily Tuesday thru Friday, Sept. 7 thru Sept. 10 and Monday thru Thursday, Sept. 13 thru Sept. 16. Classroom sessions are a combination of in class seminars and on-farm supervised instruction.

Classroom sessions are followed by 9 weeks of on-farm work experience, with students working a minimum of 16 hours per week on a local swine farm. There is no student income expected during the work experience portion of the school. Students use this time to build on and enhance the information and skills they learned during the first two weeks of classroom sessions. If the farm manager decides to utilize the student beyond the agreed 16 hours of work experience then the student would expect to be paid for any additional hours.

During this work experience students are expected to rotate through all phases of the farm, gaining experience in each area of production. Although alterations may occur based on students' needs and preferences, each student should gain experience in farrowing, breeding, nursery/finishing, field service and feed processing departments. If you are interested in hosting a Swine Jobs School student during the on-farm work experience please contact either Tom Guthrie - (517) 788-4292, Beth Ferry - (269) 445-4438 or Jerry May (989) 875-5233.

On-farm work experiences are arranged to meet the schedules of both the student and the local host farm.

Fall stalk nitrate tests

Jerry May
Pork Educator
Gratiot Co. Ithaca

One of a crop producer's main goals is to meet the nutrients needs of the crops being produced. Farmers aim to avoid over fertilizing, wasting resources and possibly polluting ground water. But, producers also don't want to stress crops and lose yields due to a poor fertilization program. Therefore most producers utilizing manure as a nutrient source soil test on a regular basis, annually analyze manure nutrients and apply manure to meet crop nutrient needs following a manure nutrient plan.

They incorporate manure to maintain the nutrients in the crop rootzone (reduce odor too) and some use pre-sidedress nitrogen tests to determine if additional N is required. At harvest farmers are either happy, or dissatisfied, with the yield, never really knowing if all the testing, analyzing and planning met or exceeded the agronomic needs of the crop. Fall stalk nitrate tests are one tool that, rather than just assisting with future decisions, helps analyze the success of the past fertility program, specifically nitrogen.

Research from Iowa State University (ISU) has shown a consistent correlation between mature stalk nitrate levels and corn yield. ISU divides corn nitrate levels at into four categories:

Low, less than 250ppm, indicates a high probability that available N was below crop needs during the growing season and therefore negatively impacted yield. Additional N during the would have had a positive impact on yield. Most stalks showing typical visual signs of N deficiency fall into this category.

Marginal, between 250 and 700ppm, is close to the minimal amount of N needed for the crop to achieve maximum yield. While the crop may not have been negatively impacted by N availability, tests results in this category are too close to the levels that would reduce yields.

Optimal, between 700 and 2,000ppm, is the level where available N most closely matched crop needs. This is considered the ideal level, during the growing season there was adequate N for the crop to achieve maximum yield.

Excess, over 2000ppm. Results in this category signify there was excessive N available in the soil. Since N was most likely over applied there is a negative economic impact for the producer and an opportunity for excessive N loss to the environment associated with this category.

When interpreting stalk N analysis one needs to recognize there are other factors beyond N application rate that impact stalk nitrate levels. Years with excessive rainfall early in the growing season will have lower stalk N levels in the fall. Conversely, in drought years fall stalk nitrate levels will be high, a result of poor yields and fertility programs based on plans for higher yields. If weather is unusually cool prior to collecting PSNT samples, the test results may indicate a requirement for additional N when in reality sufficient N may already be available. In this case if the PSNT recommendations are followed, and additional N applied, fall stalk N results may be in the "excess" category.

The nitrogen in most manure from swine finishing facilities makes up about 50% of the manure's economic value. Nutrient plans that maximize the availability of the manure N provide the opportunity for greatest economic gain from the manure application.

Crop producers utilizing manure as part of their nutrient program should make annual use of stalk nitrate tests. Testing one to two fields provides an indication on the success of the past year's N management plan. Monitoring changes in the plan over time will lead to more efficient N utilization, a potential for greater economic return and less N loss to the environment.

Stalk samples for nitrate testing should be collected in early fall after the corn is physically mature. ISU recommends collecting samples one to three weeks after the black layer has formed on 80% of the kernels. Fifteen 8" stalk samples should be collected from the area to be tested to form one single sample for analysis.

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NOT WANTED = Feral Swine in Michigan

Tom Guthrie, Pork Educator, Jackson, Co., Jackson

What is a feral swine?

Feral swine (*Sus scrofa*) is defined as a free-ranging pig and is considered to be an exotic animal that is a public nuisance. The appearance of feral swine may vary greatly as they are believed to be derived from several sources which may include: the wild European boar, escaped domestic swine and/or hybrids of the two types.

Goal for Michigan: COMPLETE REMOVAL of feral swine.

Current Law in Michigan

New law in Michigan as of June 1, 2010 allows individuals to pursue and harvest feral swine at any time. House Bill 5822 (H-2) enacts Section 4a of Public Act 328 of 1976, which concerns animals running at large, to do the following:

-- Declare that swine running at large on public or private property are a public nuisance.
-- Permit a local animal control officer or a law enforcement officer to kill a swine running at large on public or private property.
-- Permit a person with a concealed pistol permit or a valid hunting license to kill a swine running at large on public property.
-- Permit the property owner or other authorized person to kill a swine running at large on private property.

*Note: If you plan to pursue and harvest feral swine it is imperative that you follow all regulations of the respective open hunting season in which you may be pursuing feral swine. For open seasons and regulations, you may view the most current Michigan Hunting and Trapping Guide. http://www.michigan.gov/dnr

Distribution

Feral swine have been identified in 40 states ranging from California to New Jersey and from Texas to the Upper Peninsula of Michigan. In Michigan, feral swine have been reported in 68 of 83 counties.

Validated Concerns in regard to Feral Swine

<u>*Disease*</u>

It has been reported that feral swine may carry at least 30 viral and bacterial diseases in addition to a minimum of 37 parasites that affect people, pets, livestock and wildlife (Hutton et al., 2006).

<u>*Reproduction - The time to take action is now*</u>

Feral swine are very efficient reproducers and are capable of breeding at 6 months of age. The gestation period of a sow is around 115 days. Furthermore, dependant on conditions, a female is capable of having 2 litters of piglets per year with anywhere from 4 to 12 piglets per litter. The young are typically born with a 1:1 male to female sex ratio (Taylor, 2003).

<u>*Food sources*</u>

Feral swine are omnivores, meaning that they will eat both plant and animal matter. It is safe to say that feral swine are opportunistic feeders and will eat just about anything that they can get their mouth around. Therefore, feral swine are directly competing for food sources with livestock and wildlife. Food sources may depend on what is seasonably available and may range from a variety of agricultural crops including: corn, wheat, soybeans to acorns, grasses, fruits, vegetables, roots, insects, snails, earthworms, reptiles, birds, eggs, carrion (dead animals), as well as live mammals given the opportunity.

Armed and Damaging

Feral swine can be relatively aggressive when confronted, especially if the animal is a boar or a sow with piglets. Therefore, caution should be used when confronting feral swine. Additionally, feral swine can be extremely destructive to the environment and ecologically sensitive habitats. Behaviors such as rooting, tramping, digging and wallowing near water leads to bank erosion, muddying of water, creating algae blooms, and potentially destroying aquatic vegetation, therefore lowering overall water quality.

Sightings, Harvests and Feral Swine Traps

Please Report - If you have any information in regard to sightings, harvest or any sign of feral swine you may contact the following individuals.

Julie Rose, DNRE at 517-336-5030 or Rosej3@michigan.gov

Tim Wilson, USDA Wildlife Services at 517-336-1928, Wildlife Services has feral swine traps available to loan to landowners wishing to trap feral swine on their property.

Michigan Department of Agriculture: 1-800-282-3939 - press “4” for the Animal Industry Division
Additional information such as feral swine reporting forms, maps of feral swine sightings and harvests and many other resources may be found at http://www.michigan.gov/feralswine.

Fall stalk nitrate tests

Continued from page 7

These stalk segments should be cut from the portion of the stalk that is 6” to 14” above ground surface. See diagram. Samples should be stored in paper pages and allowed to breath. Do not seal the samples in plastic bags since mold and/or rotting stalks will adversely impact the results.

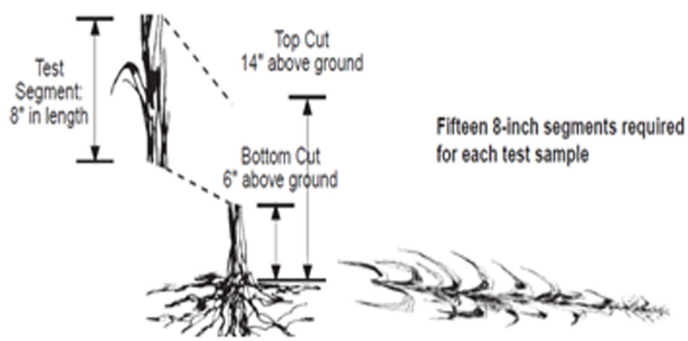

Diagram from Iowa State University, Bulletin PM 1584

Preferably send the samples to the lab immediately after they are collected. If delivery must be delayed for more than a day, samples can be refrigerated but not frozen.

The MSU Soil and Plant Nutrient Lab offers stalk nutrient analysis. Contact your local MSU Extension crops educator for assistance with submitting stalk nitrate samples.

Resources for this article:

Blackmer, A. M., A. P. Mallarino, Cornstalk testing to evaluate nitrogen management, Iowa State University,
Available: http://www.extension.iastate.edu/Publications/PM1584.pdf

Nielsen, R. L., End of season corn stalk nitrate test, Purdue University,
Available: http://www.agry.purdue.edu/ext/corn/news/articles.03/StalkNitrateTest-0915.html

Sharpiro, C. A., R. L. DeLoughery, The stalk nitrate test, University of Nebraska,
Available: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2027&context=extensionhist

Group Sow Housing Focus Groups – Initial Results

Ronald O. Bates, State Swine Specialist, Michigan State University
Beth Ferry, Pork Educator, Cass Co., Cassopolis

Introduction

During October, 2009 the Michigan Legislature passed legislation (P.A. 117) that would ban the use of stalls for housing gestating sows. Within the legislation gestating sows are defined as sows that have been confirmed pregnant. Sows that have been confirmed pregnant must be able to turn around freely, lie down, stand up and fully extend their limbs. Sows can be housed in stalls for seven days before their expected farrowing date, through farrowing and lactation and after weaning up until the time confirmed pregnant. Housing gestating sows in stalls is allowable for veterinary examination, testing or treatment as directed by a veterinarian. This legislation became effective March 31, 2010 and producers must comply with the legislation by April 1, 2020. The Michigan State University Pork Team, in collaboration with Michigan Pork Producers Association completed Focus Groups in February and March to determine what information pork producers believe they need to be able to comply with this new law and remain sustainable within the pork industry.

Focus Groups

Focus Groups were completed in February and March, 2010 in Allegan, Centreville and Mt. Pleasant. Pork Producers were asked to attend one of these sessions. In addition, producers with employees were asked to include a member from their farm staff to attend. Each Focus Group had three sessions. During the first two sessions, persons were asked to address the following statement, "When my farm changes to group housing for gestating sows I will need more information/education about…". During Session I persons were asked to develop topics that would finish this statement from a Strategic or Whole-Farm point of view to determine what information would be necessary to decide what type of group housing system would be employed when switching to group housing from gestation stalls. During Session II persons were asked to address the same statement, "When my farm changes to group housing for gestating sows I will need more information/education about…" but were to address it from tactical or an on-the-farm implementation of group housing point of view.

For both sessions, participants were given a list of items to consider that would complete the statements under consideration. Participants could keep, modify, delete and add to the list of items that would complete the statement being considered. Once the lists of items were completed participants were asked to designate which items were of most importance to them. This was done by placing an adhesive dot by the item of their choice. Participants were given five dots in which they could use as they chose to.

Aggregation of Results

After each of the three Focus Group sessions, results were aggregated across focus groups. In Table 1 are those topics of highest priority that producers indicated they needed more information to improve their strategic planning. Producers indicated that their highest priorities were information regarding what options were available to retrofit existing facilities and what systems to implement. Yet there were strong opinions regarding need for further information on all of the ranked topics. In Table 2 are the highest ranked topics pertaining to informational needs for Tactical/Implementation planning. Defining sow groups and how to form them ranked highest with Employee Training ranked second. For both strategic and tactical planning Employee Training and Education were areas of concern as producers considered their needs regarding moving from housing gestating sows in stalls to group sow housing.

On-Going Planning and Future Direction

The MSUE Pork Group has begun to use this information in educational material development and future educational programming. Presently educational material is being developed pertaining to differing group sow options, strategies for grouping and mixing sows as well as characterization of feeding systems. Future plans include evaluating and developing tools that producers can use to evaluate different group housing options. Also employee education regarding managing sows in groups will be an important component of this effort.

The MSUE Pork team has appreciated the ongoing support of the Michigan Pork Producers Association and wishes to thank those Michigan producers who participated in the Sow Housing Focus Groups. This effort was funded in part by an MSUE Program Planning grant.

For further information, please contact Beth Ferry (franzeli@msu.edu) or Ron Bates (batesr@msu.edu).

Table 1. Strategic Planning Information Needs for Group Sow Housing

Rank	Topic
1	Retrofit Options a. Characterization & Comparisons b. Cost Comparisons c. Characterization of different group housing options d. New Technology
2	Feeding Systems a. Methods b. Equipment/Technology c. Cost Comparisons
3	Employee Training a. Managing Sows in Groups b. Managing Body Condition Score c. Minimizing Aggression d. Handling Pregnant Sows e. Assessing Employee Skill level & adaptability
4	New Construction a. Cost Comparisons & Option b. Regulations c. Comparison between retrofit options and new construction
5	Genetics a. Durability b. Productivity c. Temperament d. Breeds/Lines by Group/Pen Size
6	Production Scheduling a. Sow flow by stage of gestation b. Phase segregation – by stage of gestation
	Topics that were ranked at one Focus Group site only • Government funding for compliance • Educating the Public • Possible federal regulations superseding Michigan rules

Table 2. Tactical/Implementation Informational Needs for Group Sow Housing

Rank	Topic
1	Defining a Sow Group a. Large Pen vs Small Pen b. Group size, pen configuration, square footage/sow, sow size (BCS & Weight) c. Forming new sow groups – mixing and sorting
2	Stockperson Training a. Sow Behavior & Observation b. Stockperson adaptability to change c. Learning new technologies and equipment maintenance d. Finding NIP sows e. Sow Handling
3	Medical Care a. Sow assessment and & medical treatment in groups b. Vaccinations
4	Feeding & Watering Technologies in Groups a. Feed form – bulkiness etc b. Calibration – allotment per sow c. Water delivery
	Topics that were ranked at one Focus Group site only • Worker Safety • Novel equipment for group housing and its durability • Concerns of decreases in productivity • Accurate definitions of rules and regulations

Pork Quarterly

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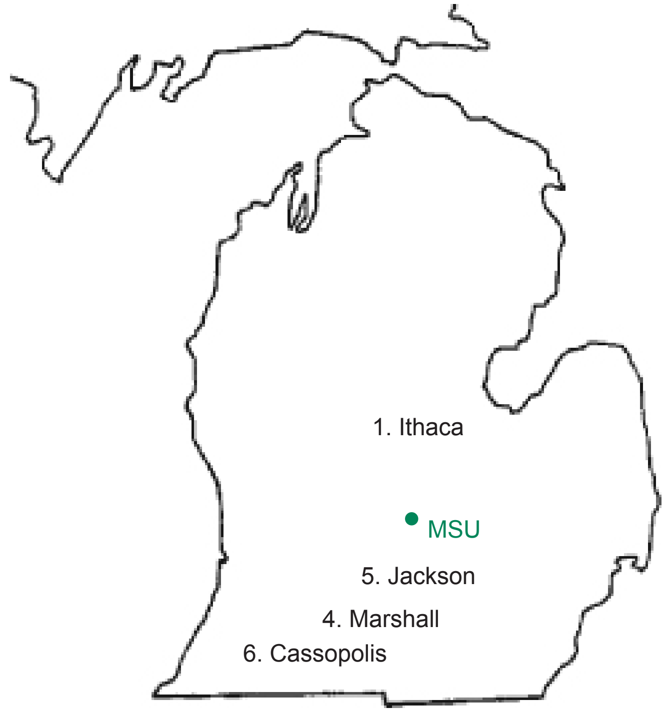
All comments and suggestions should be directed to:

MICHIGAN STATE UNIVERSITY EXTENSION



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ANIMAL AGRICULTURE INITIATIVE

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Funded by Animal Initiative Coalition Grant Program