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Assessment of triticale varieties for swine feeding performance and tolerance to late planting

Abstract: Triticale holds potential as a third grain crop in Iowa. This project studied different cultivars to assess their suitability for production and use as swine feed.

Question & Answer

Q: How can Iowa farmers use triticale?

A: Triticale can reduce soil and nitrogen losses from Iowa crop production systems while serving as a high-quality feed. The best grain yields were obtained from a winter triticale variety bred and developed for grain production in Iowa. To avoid grain yield losses, winter triticale should be planted before October 1 in northern Iowa and October 15 in southern Iowa.

Background

A multi-investigator project at Iowa State University has been assessing the feasibility and economic success of adding triticale to grain and livestock systems in the U.S. Corn Belt. The purpose of this research is to generate reliable utilization, agronomic and economic information that demonstrates the feasibility of including triticale in the traditional corn/soybean rotation. Adding triticale to cropping systems could provide environmental benefits, such as erosion control, improved nutrient capture and nutrient cycling, and better nutrient use efficiency. This project will further efforts to evaluate triticale feed value for swine and its adaptation in Iowa.

Project goals were to:

1. Determine the feed value of Trimark 37812 and NE426GT, two high-yielding grain triticale varieties, targeted for seed increase in Iowa; and

2. Provide critical information on triticale adaptation and variety performance in Iowa and identify plant traits that allow winter triticale to maintain high yields even when planted in late fall.

Approach and methods

Pig performance in bedded hoop structures was evaluated at the Western Research and Demonstration Farm at Castana using NE426GT winter triticale. The feeding trials investigated the use of triticale for 40 and 80 percent of swine diets during the last 60 days of the feeding period. Plant traits that allow winter triticale to maintain high yields even when planted in late fall were characterized in a second study. Response to late planting was evaluated by seeding 13 genetically diverse cultivars on early and late planting dates at three locations and identifying traits associated with yield maintenance.

Results and discussion

The greatest grain yields were obtained from NE426GT, a winter triticale cultivar bred and developed for grain production in Iowa, demonstrating the importance of developing varieties specifically tailored to Iowa conditions. In southern Iowa, NE426GT produced yields from 90 to 116 bu/ac with low capital expenditure. Delaying planting from October 1 to 15 did not reduce grain yields in southern Iowa. Yield losses from late planting were as great as 29 percent in northern Iowa.

Winter triticale cultivars with high grain yields and resiliency to late planting had larger fall plant weights, fewer kernels

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per spike, and larger kernel weights than winter triticale cultivars with smaller plants in the fall, more kernels per spike, and smaller kernel weights. These traits could be used to improve winter triticale grain yields and late planting tolerance.

Swine finishing rations that contain triticale were constituted at a lower cost than corn-based diets because they contained up to 25 percent less soybean meal and 90 percent less dicalcium phosphate. However, the average daily gains and feed efficiency of triticale diets were less than for corn-based diets. Inclusion of triticale at 80 percent of the diet reduced average daily gains by 12 percent and feed-to-gain ratio by 17 percent. The major limitation to feeding triticale to finishing pigs was the presence of mycotoxin in years when the crop was infested with *Fusarium* head blight during growth.

Conclusions

The feed value of Trimark 37812 spring triticale could not be determined because *Fusarium* head blight infestation during crop growth resulted in high mycotoxin levels in the grain and made it unacceptable as a swine dietary element. Pigs fed NE426GT winter triticale had 0.12 percent less average daily gain and 0.17 percent less feed to gain ratio for each unit of triticale substituted for corn in the diet. Backfat and fat-free lean percentages were similar to those for pigs fed triticale and corn. The cause of reduced pig performance on NE426GT triticale when compared to corn could not be determined, but did not appear to be from differences in feed acceptance, mycotoxins, energy content, or lysine concentration among the three diets.

When averaged across all cultivars and both early and late planting, triticale grain yields averaged from 58 bu/ac in northern Iowa to 84 bu/ac in southern Iowa. Cultivar selection by crop producers should be done using data from multiple locations and years. The grain yield of NE426GT was statistically significantly superior to all other cultivars under both early and late planting regimens.

Planting in mid-October rather than late September resulted in lower grain yield in central and northern Iowa, but not in southern Iowa. The grain yield reductions from late planting at Calumet in northern Iowa suggest it was the best environment for testing tolerance to late planting in Iowa using the methods employed in this study.

Impact of results

The findings of the swine feeding, cultivar testing, and planting date evaluations in this research demonstrated the potential for producing and feeding triticale in Iowa, but also pointed out the need for further improvement of the crop to decrease risk to Iowa producers. One winter triticale cultivar proved to have superior grain yields when compared to the other 11 cultivars tested. Swine-finishing rations that contain triticale cost less than corn-based diets, however, they also produced lower average daily gains and feed efficiency than the corn diets.

The major limitation to feeding triticale to finishing pigs was the presence of mycotoxin in years when the crop was infested with *Fusarium* head blight during growth. Widespread *Fusarium* infection generally occurs in one of every four or five years in Iowa. (Triticale infected by *Fusarium* may still be used in finishing rations for ruminant animals.) Current work being done to improve *Fusarium* resistance in small grains is focused on wheat and barley rather than triticale.

Several important recommendations emerged from this research:

Cultivar tests indicated that the greatest grain yields were obtained from a winter triticale variety bred and developed for grain production in Iowa. To avoid grain yield losses, winter triticale should be planted before October 1 in northern Iowa and October 15 in southern Iowa. When planting was delayed by only a few weeks, grain yields decreased up to 29 percent. Mycotoxin-free triticale grain can be substituted successfully for corn in swine-finishing rations; however, winter triticale infested with *Fusarium* head blight should be tested for mycotoxins before feeding to any other animals.

Research on triticale in Iowa should include development of cultivars resistant to *Fusarium* head blight, identification of composition and diet factors that lead to reduced gains relative to corn, and feeding research with other livestock species and classes. Outreach efforts should focus on improving cultural practices through farmer education about proper cultivar selection, planting dates, soil and fertility management, and harvest techniques. Poor resistance to *Fusarium* head blight infection and lack of support in federal farm programs are major factors that limit widespread production of triticale in Iowa.

Education and outreach

Publications generated by this project included three ISU Extension publications (Iowa Crop Performance Tests – Winter Wheat and Winter Triticale, 2005 and 2006, AG 6 and Feeding Small Grains to Swine, PM 1944), two ISU research farm reports (Southeast Research and Demonstration Farm Winter Triticale Variety Test, 2005, and Northwest and Allee Research and Demonstration Farms Winter Triticale Variety Test, 2005), and features on triticale diets for swine in two ISU Animal Industry Reports, ASI-R2159-2006, AS-652 and ASL-R2030-2005, AS-651.

Articles in *Meat Science* and the *Journal of Animal Science* deal with effects of triticale-based diets on finishing pig performance and pork quality in deep-bedded hoop barns.

Leveraged funds

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