NDSU RESEARCHERS "REWRITE THE BOOK" ON FEED GRAINS

GARY MORAN

Read the "classic" literature and textbooks on livestock nutrition and you may get the impression that the U.S. livestock industry runs on corn and soybean meal. That may be true in some areas of the country, but not for North Dakota livestock producers.

In the first place, North Dakota is not a major corn-producing state. In the second place, North Dakota livestock producers have more feed grain alternatives than areas where corn and milo are just about all that's available. North Dakotans have the option of using barley and oats if availability and economics make them the best choice. Or, perhaps a producer has an opportunity to obtain damaged wheat, screenings or cull edible beans. And the growth of the sunflower industry presents the opportunity to use sunflower meal or even sunflower seeds in livestock rations.

The problem is, the "classic" livestock nutrition literature doesn't answer all the questions about feeding some of these feedstuffs. In the case of some of the more atypical feeds like screenings or sunflowers, it may not even ask the questions, let alone answer them. Even worse, much of the available literature on nutrient content of feed grains doesn't seem to be accurate for grains produced under North Dakota conditions.

To help fill in these gaps, ongoing research headed by the Department of Animal Science is aimed at determining the nutritive content and value of the types and varieties of feed grains produced under North Dakota conditions and production systems.

Dr. Robert Harrold, project leader, says the feed grain research has two major thrusts — to help North Dakota livestock producers prepare more effective rations, and to provide a more realistic market value for feeds produced in the state.

Experimental procedure is to first evaluate the feed in the laboratory to get an idea of the nutrient content. Samples are analyzed for crude protein, amino acids, fiber and minerals. The next step is feeding various levels to animals and observing performance. If the feed can be used at effective levels, the researchers start looking at the availability of nutrients in the feed — what percentage of the gross composition can be used by the animal? Presence of a nutrient or mineral when a feed is chemically analyzed doesn't mean it is in a form that can be digested by an animal. For example, barley and oats have about twice as much available phosphorus as corn does, but the gross phosphorus content doesn't vary much.

Analysis of feed grains begins in the laboratory, then progresses to laboratory animals, then findings are checked out on livestock. Dr. Robert Harold, feed grains project leader, checks out a sample.

The work has most application to swine and poultry producers, so test animals have included pigs and chicks as well as rats. Rats are used in laboratory feeding trials as a

model for pigs. The researchers hope to obtain feeding formulas based on rat data that allow them to predict performance of pigs on the same rations. Using rats in feeding trials to obtain preliminary data is a lot faster and cheaper than using pigs to start with. Chicks are usually used for mineral work, again primarily for considerations of speed and cost. In the case of both rats and chicks, the information obtained essentially applies directly to pigs as well because all three have similar digestive systems and nutrient needs.

Naturally enough, the first grains the NDSU researchers considered were barley and oats. Since then, they have gone through the gamut of weed seeds (screenings), cull pinto beans and sunflower seeds and meal. Some work has been done with wheat and durum, but generally use of these for livestock feed can't compete with human use in terms of price. Information obtained on feeding wheat and durum is useful primarily when there are quantities that can't be used for human food for some reason — sprout-damaged wheat, for example.

Besides the obvious applications of learning more about how best to formulate livestock rations using North Dakota grains, information gained from evaluating feed grains has been of value to other researchers. Earl Foster, barley researcher in the Department of Agronomy, says he uses information from feed grain research, especially protein contents, as a basis for barley breeding. One thing that feed grain evaluation clearly demonstrates, says Foster, is that the feed barley classification is often a misnomer. In the grain trade, varieties best for malting and brewing are classified as malting barley; all others are classified as feed barley. The feed barley classification implies that these varieties are preferred for feed, but some so-called feed barleys are no better for feed than the malting varieties. Foster mentions a new barley released by another state that is extremely poor for malting, so it is classified as a feed barley. Unfortunately, it is almost as bad for feeding as it is for malting. (It does yield very well, however.)

Foster's involvement with animal science researchers snuffed out one barley breeder's pipe dream — tailor-making different barley varieties for different types of livestock. Weaning pigs, for example, require higher protein than growing-finishing pigs; the ideal barley for feedlot cattle might be different than either. However, it is just more realistic to take a given barley and supplement it for a particular class of livestock. One area Foster is still interested in pursuing is high-lysine barley varieties.

The NDSU animal scientists have gained considerable notoriety for their work with the more atypical feedstuffs. Weed seeds, for example, can be a good source of nutrients. Turkey producers in particular often use large amounts of screenings as a low-cost ration ingredient. Evaluation of nutrient levels and feeding trials have helped develop guidelines for feeding — the upper limits for screenings in a ration, what producers can pay for screenings relative to other feeds, etc.

Cull pinto beans are another potential feed that have become more common in North Dakota. Results to date speak loud and clear — raw pinto beans do **not** work well in swine rations. "We think it's best for us to find out things like this at the Experiment Station rather than for producers to lose money finding out the hard way," Harrold says.

Sunflower meal and sunflower seeds are other recent arrivals on the local feeding scene. "We now know the first three limiting amino acids of sunflower meal," Harrold says. "This lets us do a better job of balancing rations for pigs and poultry."

The three amino acids in question are lysine, threonine and methionine. It also turns out that threonine and methionine are co-limiting; it doesn't do any good to supplement one and not the other.

The thrusts of nutritional research with sunflower have been to develop information about the practical limits for sunflower meal and whole seeds in swine rations as well as nutrient content analysis in the laboratory. How much sunflower meal can be fed is dictated by the fiber content as well as the availability of supplemental amino acids. Use of whole seeds in swine rations is limited by the development of soft, fatty pork when high levels are fed — a product unacceptable to the consumer.

Some evaluation work involves human rather than livestock nutrition. This cooperative research involves food and nutrition researchers in the College of Home Economics and their work on increased utilization of North Dakota-grown products ("Rats do really well on pizza with sunflower flour in the dough," Harrold says.)

Future plans are to look both wider and deeper. Research will involve additional North Dakota products as production trends change or additional questions arise. Existing feedstuffs will be examined more closely for content and availability of additional nutrients. NDSU livestock researchers will continue to rewrite some of the nutrition textbooks, in language most appropriate to both growers and feeders of North Dakota-produced feed grains.