Bean Research: AGAINST THE ODDS

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The importance of edible bean production in North Dakota has increased dramatically in the last few years. The state is now one of the leading producers of edible dry beans with 1982 crop pegged at an estimated 2.8 million hundredweight. North Daktoa is second in the production of navy beans.

No new crop is without problems and edible beans have their share and then some. North Dakota has all the problems that bean growers elsewhere have endured plus a shorter season thrown in for a kicker, not to mention a need for a non-discoloring pinto that will come out of storage as bright as when it went in.

So a couple of bean researchers at North Dakota State University have their work cut out for themselves in a fledgling program just getting under way. What Drs. Ken Grafton and Glen Weiser hope to do is create varieties with these characteristics: upright, high protein (quality and quantity), nitrogen-fixing, low flatulence, high yield, disease resistant or tolerant, adapted to a short growing season and non-discoloring in the case of pintos.

Grafton and Weiser have limited their evaluation to plots on the main station fields in Fargo because that's all they can effectively screen. But they have variety trials in four other locations — Forest River, Hatton, Oakes and Wyndmere — to check adaptability, yield and disease resistance. Out of 365 crosses made in the greenhouse last year, they're looking at 1,500 first generation plants at the end of the harvest seeason this year. Weiser and Grafton are using a new procedure to make crosses that are less damaging to the flowers, which results in less natural abortions. So now they'll be able to make more crosses in less time.

At Fargo, 66 lines are being evaluated along with 48 experimental pinto lines developed by Dr. D.W. Burke with the USDA in Prosser, Washington. This cooperative arrangement was set up by Dr. Al Schneiter at NDSU and resulted in the recent release of Pindak. Other releases are expected relatively soon. Most of the Burke material is early and high yielding. But that doesn't mean that such lines will perform well under North Dakota conditions. Material that's early maturing in Washington can be too late maturing for consideration in North Dakota.

Dr. A.A. Schneiter, NDSU agronomist, inspects a well-filled pod of a potential new variety of pinto bean. A major part of the edible bean research is conducted at the Main Station.

One of the really limiting factors in a successful bean industry is the inability of North Dakota to start its own certified seed program. Maintaining a certified seed program out in the western states carries a high price tag: $300,000 to increase seed and maintain production of Pindak certified seed alone.

While North Dakota may never be able to handle all its certified seed requirements, it could handle a sizable

portion, says Grafton. But he thinks that the bean program could contract with farmers in the western part of the state where bean diseases are rarely if ever found, and keep certified bean seed money in the state. Such farmers might have to furrow irrigate or risk erratic yields under dryland conditions. But due to the higher price for certified seed, even dryland certified bean production should be a money-making proposition.

Cooperating farmers in the NDSU bean program have been highly cooperative and have helped the researchers keep operating expenses down. The Red River Valley Bean Growers Association has a nickel a bag checkoff for research and promotion to develop new markets. Such markets could help stabilize the erratic swings in the market. Membership in the organization changes about 20 percent each year and a bean grower doesn't have to be a member so he might not be subject to the nickel a bag checkoff.

While the bean program may be suffering from limited financial backing, it is not short on enthusiasm. Weiser is especially interested in assessing the role of nitrogen fixation in beans. They are woefully low in fixing nitrogen compared to soybeans or alfalfa. He wants to look at nodulation response to different types of bacteria. Studies in the greenhouse and in the field are measuring the amount of nitrogen fixed. After crossing and analyzing progeny from high and low nitrogen crosses, the breeders can select types that fix high amounts of nitrogen. This tactic would have several advantages: increase yields due to nitrogen fixation, reduce fertilizer requirements, leave some residual ntirogen for crops following beans, and increase the quality and quantity of bean protein.

Weiser hopes to cooperate with the Department of Cereal Chemistry and Technology in running protein assays. Edible beans currently are about 20 to 25 percent protein. Soybeans are at least 10 percent higher. The genetics are there to hike the amount of protein. Whether buyers would pay for extra protein might be another question but Weiser's idea of higher protein might help solve a world-wide energy protein crunch.

And the bean might be a world beater but color and other characteristics, as well as tradition, die hard. Consumers in the U.S. seem to prefer white beans generally with pintos coming on in different localities. Mexico prefers mostly pinto, Cuba and the Caribbean area prefer black beans, as does Brazil. Central and South America generally seem to prefer red or yellow beans.

Color that stays bright in storage is another must for growers in North Dakota. Because of marketing patterns, most growers store their pintos. North Dakota pintos bring a dollar per hundredweight less because they darken in storage. Kidney beans have been selected for color so neither Grafton or Weiser see too much problem developing a pinto that keeps its color in storage.

Navy beans have been upright for years, helping ease harvesting. Attempts are under way to breed a more upright, less viney pinto to help at combining time as well as lessen the possibility of disease, especially from blight and rust, possibly from white mold. One pinto, Ouray, now has a somewhat upright shape. Black lines such as Midnight, starkly upright, might provide the upright characteristic.

Dr. Ken Grafton, NDSU bean breeder, holds an experimental bean line which displays the upright characteristic sought for ease of harvesting and as a possible aid against bean disease.

So far, there is no genetic resistance to white mold so the best bet is to change the shape of the plant so air will dry off the plant quickly once wet. White mold, bacterial blight and rust all need humid conditions to spread. Fungicides are available but expensive since white mold starts at the base of the plant. So fungicides have to be applied in large amounts of water with the nozzles well down in the bean plant's base.

By contrast, rust can be controlled with close frequent inspection and timely applciation of fungicides. Once started, the sprays must continue until bean maturity. White mold can wipe out an entire field. But rust very late in the season can be beneficial as a defoliant.

Proper crop rotation between a bean or sunflower crop will help reduce the likelihood of white mold. But even a skip of four years between those crops might not do the job, since white mold is known to overwinter and survive for as long as 10 years.

After all the other production problems have been solved, there still remains the bean itself and the gas problem it gives some people. Apparently this varies with different people and with what people eat in combination with beans. Whatever the causes for flatulence, it is a consideration as far as marketing is concerned. Dr. Mark Dreher of the NDSU School of Home Economics and chemists in the Department of Cereal Chemistry and Technology have been using beans as protein and flour extender but continue to run into the flatulence problem. A complex group of chemicals are involved and good screening techniques are unavailable.

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acre and a value of 10 cents per pound, the value was $250 million. The USDA and NDSU cooperative breeding programs have produced most of the superior disease resistant and productive sunflower inbreds used in hybrid sunflower production in this region. If hybrids produce 200 pounds more per acre than open pollinated varieties that might have been grown in the state, the research benefit would have added $20 per acre or $50 million to the sunflower crop value in 1980 alone.

The Fish and Wildlife Service, in their last evaluation, placed sunflower losses to birds at 1.2 percent of the crop in North Dakota and Minnesota, about 12 pounds per acre overall. Birds accounted for over 40 million pounds of seed in 1979 when 3.4 million acres were harvested. With oilseed prices at 10 cents per pound, North Dakota farmers lost about $4 million. The bird resistance program is budgeted at about 1 percent of the estimated annual loss of sunflower seed to birds.

Inbred lines with bird resistance can be incorporated into hybrid breeding programs. Additional studies are being performed to identify physical or chemical characteristics of sunflower that could provide resistance to bird attack.

The Seedstocks Project also is initiating research into production of dry edible bean seed in western North Dakota as a means of replacing the need for increase fields in Colorado, Idaho and Washington. If this research is successful, the savings to dry bean producers in terms of seed costs could be in the range of $2 to $3 million per year in addition to increased incomes from the sale of seed.

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The northern plains region has a whole lot of agricultural produce to offer, but for every crop raised on the northern plains which may interest a prospective customer, there is a competitive or alternative crop raised somewhere else that might interest him instead. North Dakota raises wheat, but so do Canada and Argentina and Brazil — and at the moment Canada can offer lower freight rates than the U.S., most countries have more favorable exchange rates than the U.S., and a good many countries have come to enjoy reputations as more reliable commodity suppliers than the U.S. All this means that it is more important than ever for North Dakota region producers to be certain that prospective buyers fully understand the advantages of purchasing high-quality products of the northern plains.

In offering educational programs, the Northern Crops Institute will work closely with the Foreign Agricultural Service of the USDA through U.S. Wheat Associates, a promotional organization with offices in Chile, China, Egypt, Holland, Hong Kong, India, Japan, Korea, Mexico, Morocco, Philippines, Singapore and Taiwan. U.S. Wheat Associates is supported by commodity groups in North Dakota and twelve other states. Donnelly expects to use its vast network to make initial contact with a number of the trade teams that will come to Fargo for training. Because wheat is the best-known crop of the northern plains, it is a very good starting point for introducing the world to other crops of the region. Later, the Institute hopes to work with market development organizations such as the U.S. Feed Grains Council.

Donnelly is optimistic about what the Northern Crops Institute will accomplish for agriculture in North Dakota, Minnesota, Montana and South Dakota over the long term. He gets a little nervous, however, when anyone suggests that the Institute is going to turn up quick bucks for northern plains farmers. Education does not turn up quick bucks. It isn't a quick fix.

"Running a crops institute," says Donnelly, "is rather like running a farm. You cultivate, you sow, you wait. Maybe you make money the first year and maybe you don't. But if you do the job right, you expect to come out ahead over the long haul. We intend to do a good job of informing the world about northern crops, and in the long run we expect this to pay off."

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Weiser hopes to set up tests this winter in which he can grind bean flour, inoculate it with bacteria and measure the gas produced. The information gained may be specific enough that he can then select bean lines and modify through plant genetics. And of all the work done with flatulence in the past, none has been done from the plant genetics standpoint.