ABSTRACT
Crambe (Crambe abyssinica Hochst.) has been evaluated as a potential industrial oilseed crop in the United States and Europe (1980-1990). However, renewed interest in alternate crops and a diversified agriculture has stimulated the research effort of crambe in North Dakota. A multidisciplinary team of university researchers, industry professionals, and farmers has been assembled to evaluate the potential of commercial crambe production in the Northern Great Plains. Research in crambe has identified suitable production practices and possible management problems for crambe grown in North Dakota. This integrated effort has resulted in the first successful field-scale production, processing, and marketing of crambe oil.

INTRODUCTION
Crambe (Crambe abyssinica Hochst.) is a member of the mustard (Cruciferae) family, which includes crops such as rapeseed and turnip mustard. Crambe, native to the Mediterranean region, was first introduced into the United States during the 1940s and has been under development by various state and federal agencies since that time. Crambe is an erect annual with large pinnately lobed leaves similar to mustard. The crop exhibits an indeterminate flowering habit and may continue to set seed late in the season. The plant produces numerous white flowers that result in small round seeds borne singly on pendant racemes. Each seed is enclosed in a bur or pod which usually remains on the seed after harvest. Crambe seed yields an industrial oil (> 30%), which contains a high level of erucic acid (> 35%), a valuable, renewable raw material for industrial products. Erucic acid is a 22-carbon, saturated fatty acid containing one double bond. High erucic acid oils and derivatives of erucic acid have current potential use as a raw material for emulsifiers, plastics and nylon, paints and coatings, and high temperature lubricants (Van Dyne et al. 1986).

The USDA’s Office of Agricultural Industrial Materials identified crambe’s potential and leads a commercialization project by organizing and coordinating a team research effort involving the High Erucic Acid Development Consortium of universities and government (HEADE), private organizations, and farmers.

As a member of HEADE, North Dakota State University initiated a multidisciplined integrated research and development effort towards commercializing crambe in 1989. The project aims to coordinate a diverse set of crambe research projects to accomplish the goal of establishing and maintaining a significant production and processing base for crambe in the Northern Plains. Several significant nitrogen responses were not observed in 1989 and 1991. The lack of response could be attributed to moisture stress in 1989 and relatively high residual nitrogen levels in 1991. A significant response to nitrogen was observed at two locations in 1990. The addition of 34 kg ha⁻¹ of phosphorus resulted in a yield increase two years out of three at the location having the lowest level of residual phosphorus. An analysis of the effect that soil fertility may have on crambe oil quality is not completed at this time. Although these studies have not been conclusive concerning the fertilizer needs of crambe, the data does begin to serve as a basis to provide soil fertility recommendations to growers.

SOIL FERTILITY MANAGEMENT FOR CRAMBE PRODUCTION
J.C. Shick, P.B. Gontis, B.K. Hansen, and B.G. Schatz
The soil management base for crambe production in the Northern Plains is limited. An Oregon experiment showed nitrogen applications of 0 to 134 kg ha⁻¹ resulted in no differences in seed yield (White and Higgins 1986). Crambe fertility in western Kansas indicated a nitrogen rate response as nitrogen rate increased (Putnam 1974). The knowledge of proper nitrogen and phosphorus nutrition for the production of an efficient seed yield with good oil quality is essential to crambe producers. Trials were conducted for three years at three locations in North Dakota to evaluate the influence of different rates of phosphorous and nitrogen fertilizer on crambe yield and oil quality.

Significant nitrogen responses were not observed in 1989 and 1991. The lack of response could be attributed to moisture stress in 1989 and relatively high residual nitrogen levels in 1991. A significant response to nitrogen was observed at two locations in 1990. The addition of 34 kg ha⁻¹ of phosphorus resulted in a yield increase two years out of three at the location having the lowest level of residual phosphorus. An analysis of the effect that soil fertility may have on crambe oil quality is not completed at this time. Although these studies have not been conclusive concerning the fertilizer needs of crambe, the data does begin to serve as a basis to provide soil fertility recommendations to growers.

FIELD-SCALE EVALUATION AND COMMERICALIZATION
J.C. Gardner
In the spring of 1990, a project was established to attempt commercial-scale crambe production and planting of crambe in North Dakota. A partnership of responsibility and risk was organized among HEADE, thirty-eight North Dakota farmers, and National Sunflower (NSN). NSN is a major oilseed processor with a 3.6 million acre facility near Enderlin, ND. HEADE, working through individuals at NSN, was responsible for soliciting farmers to grow crambe, providing seed and production information, and serving as a link between the farmers and the processor. Crambe was planted on 970 ha in early May and 88% of the crop was successfully seeded. Treatments were designed to assist in assessing the knowledge base of information that can be used to implement an efficient crop production program for crambe in the Northern Plains. Utilization farmers have also elected to expand the markets for high erucic acid oils. This effort has also helped identify future research needs in the area of crop production. The integration of these efforts along with those of other HEADE members, industry, and growers has resulted in the successful commercialization of crambe.

REFERENCE

Acknowledgments
ACKNOWLEDGMENTS
REFERENCES


