

## **FEEDING VALUE OF FIELD PEAS AND NAKED OATS FOR LIVESTOCK - PROJECT DESCRIPTION**

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### **SUMMARY**

This project is a series of studies designed to evaluate the efficacy of using field peas or naked oats as substitutes for all or a portion of the grain and/or protein supplement (e.g. soybean meal) in diets for weaned and growing pigs and calves. Demonstration of the potential of North Dakota grown field peas and naked oats as a livestock feed for growing livestock should provide several benefits. If the results suggest that these alternatives are suitable substitutes for traditional feed grains, livestock feeders would be presented with a larger array of feedstuffs from which to formulate least cost diets. Additionally in rising soybean meal markets, peas may provide a lower cost protein supplement option. Data from this project will also help commercial feed manufacturers, nutrition consultants, extension personnel and individual producers formulate swine and cattle diets using field peas/naked oats as a protein/energy sources. Increasing marketing options for field peas and naked oats is the principal goal of this group of investigations. Given the ability of field peas and naked oats to fit well into small grain rotations, they provide a potential niche in systems of food/feed production that are sustainable and environmentally friendly for North Dakota.

### **INTRODUCTION**

Late last year (1994), the North Dakota Dry Pea and Lentil Growers Association (DPLA) requested North Dakota State University to consider a regional evaluation of dry field pea grain as a domestic feedstuff. After reviewing the available literature, scientists at the Dickinson Research and Extension Center outlined to the association's board of

directors possible work that could be conducted at the station. Potential projects were designed to address the DPLA request for research, while contributing to the body of knowledge regarding the use of legume seeds as livestock feeds. In addition to this specific request for research, station and extension personnel have become acutely aware of a growing interest in southwestern North Dakota for more information regarding the production and use of hull-less, or naked, oat grain. The interest regarding naked oat grain has not been confined strictly to grain growers. Diversified operators, as well as straight livestock producers, have demonstrated an interest in this type of grain for use as a livestock feed. The goal of field pea and naked oat producers is to increase the marketing options for their grain. Livestock producers, on the other hand, are interested in developing low cost alternatives to expensive energy and protein supplementation. In order for these grains to expand into the feeding sector, producers feel that localized research focusing on domestic feed usage is essential.

Alternative crops are playing a greater role in North Dakota field crop production. Legume crops, such as field peas, fit well into conventional crop rotations and compliment soil fertility. Soil fertility enhancement reduces the amount of commercial fertilizer needed to meet crop yield goals. Peas have been regarded highly for their nutrient quality in human and animal food since they were first cultivated. During the last decade in North Dakota, there has been a renewed interest in the use of field peas as a livestock feed.

Common oats is lower in energy and more bulky than other feed grains, since it threshes with the hull intact. Oat groats (dehulled oats) are comparable to corn in feeding value, while containing more lysine and nearly twice as much crude protein. However, mechanical dehulling is expensive. Naked oats, by comparison, have loosely attached fibrous coats that are easily rubbed off during threshing. The resulting grain has a higher nutritional quality and could be a cost effective feed ingredient. Paul oats, a newly released naked oat variety from NDSU, which producers are very interested in, will be used in the proposed set of experiments.

## **PROJECT BRIEFS**

Cattle feeding studies will focus on the potential use of field peas and Paul oats as feedstuffs for weaned calves. Specific objectives include:

1. Determine the effect of including field pea or naked oat grain in backgrounding diets for weaned calves on

- animal performance and efficiency of feed utilization.
2. Establish relative net energy concentrations for test feeds.

Individual experiments will involve either early (5.5 months) or late (7 months) weaned calves backgrounded for approximately 90 days. The studies will evaluate the potential of substituting all or a portion of the barley and soybean meal in a control diet with the test feeds. In addition to documenting animal performance and feed efficiencies, treatments are designed to establish relative net energy values for the test feeds. This information is vital when formulating rations using field peas and naked oats.

Swine feeding studies are designed to evaluate peas and oats in weanling pig diets and peas and lysine levels in split-sex fed growing-finishing pigs. Specific objectives of these studies include:

Weanling pigs -

1. Determine whether conventional farm grain dryers, steam rolling equipment or portable extruders will sufficiently heat field pea grain, without damaging, to deactivate antinutritional proteases that interfere with normal digestion, and identify the most favorable and cost effective method.
2. Determine the extent at which field peas can replace (0, 25%, 50% or 100%) soybean meal with respect to weanling pig performance.
3. Determine the extent at which naked oats can replace (0, 25%, 50% or 100%) corn with respect to weanling pig performance.
4. Based on results of the first three objectives, determine growth performance of weanling pigs when field peas and naked oats are included in the diet.

Grower and finishing pigs -

1. Evaluate growth and carcass performance following field pea substitution for soybean meal in split-sex fed barley based growing-finishing diets supplemented with two levels of lysine.
2. Evaluate seasonal (winter vs summer) variation in nutrient intake and subsequent impact on growth and carcass response.

Antinutritional factors (trypsin and chymotrypsin inhibitors, lectins and tannins) in raw field peas may limit the quantity of peas that can be included in weanling pig diets. When compared to raw soybeans, spring seeded white-flowered field peas contain 5-20 times less protease (trypsin and chymotrypsin) inhibitor activity. White-flowered, smooth, spring seeded pea varieties grown in North Dakota contain relatively low amounts of lectins and tannins, and based on other research would not appear to be a problem to the weanling pig.

Heating is a proven method for destroying the protease inhibiting factors that can depress swine performance when present in sufficient quantities. Therefore, the first of four experiments in the series of studies with weanling pigs will be to evaluate field pea heat treatment methods (dry heat, steam heat, and heat of extrusion) on pig performance. The second objective, based on results addressing the first objective, will be to determine the level of treated peas (0, 25%, 50%, 100%) that can be used to replace soybean meal in a corn based diet. The third objective will be to determine the level of naked oats (0, 25%, 50%, 100%) that can replace corn. In the fourth objective, based on the results of the first three experiments, a corn/soybean meal control diet will be compared to three experimental diets containing either: 1) field peas, 2) naked oats, or 3) field peas and naked oats.

In a second series of experiments, using split-sex fed growing-finishing pigs and a three phase feeding regime, the efficacy of replacing soybean meal with field peas will be evaluated. Additionally, two levels of lysine supplementation will be tested in the three phase feeding regime (Grower - .85% vs 1.0%; Finisher I - .75% vs .9%; Finisher II - .7% vs .85%). Effects of protein supplement type, sex and lysine level on various carcass measurements (fat depth, loin depth, loin area, percent lean, carcass yield, net carcass value) will be assessed. Carcass measurements will be obtained at the John Morrell & Co. Packing Plant in Sioux Falls, SD.

## RESULTS

In the first cattle experiment, calves were weaned and placed into lots on September 26. Calves are currently being brought up on feed. The introduction of test grains into respective diets began on October 25 and levels increased until desired diets are achieved. This experiment should be completed by the end of the year. Calves in the second experiment will start on feed in mid- to late November. All data collection in the cattle studies should be completed by April, 1996.

Weanling pig experiments (4) will be conducted as pigs are group weaned in December, January, February and March. Growing/finishing studies will evaluate dietary effects in both winter and summer environments. The winter study will begin in early December and the summer study will begin in early June. Data collection will be completed by the end of September.

## **DISCUSSION**

Typically, field peas and hull-less varieties of oats are not fed to livestock in North Dakota. As the acreage for these crops expands, producers are looking for alternative markets for their grain. The nutritional data on these two types of grain suggests that both crops have the potential for use as a feed for livestock. If feed barley is valued at \$1.75 per bushel and soybean oil meal at \$195 per ton, the feed value of field pea and naked oat, on an equivalent crude protein basis, would be approximately \$3.50 and \$1.80 per bushel, respectively. The value of naked oat per pound, using this type of substitution, is about 117% of the price for barley. This is similar to the value of naked oat (119%) relative to barley reported by Doyle and Valentine (1988) for the United Kingdom. No such comparison for field pea has been published. Current prices of field pea and feed oat indicate that either of these feeds has a potential for economically replacing a portion of the barley and protein supplement, if production is not comprised disproportionately. Additionally, decreasing the level of barley fed to cattle could reduce the negative affects (e.g. bloat, acidosis) occasionally experienced with barley feeding. Of the research data available, little work has evaluated the feeding value of either field pea or naked oat in beef cattle diets. Establishing feeding values is essential if the grains are to be used in least cost ration formulations for beef cattle.

The entire project is scheduled to be completed by September 30, 1996, and a final report prepared by the middle of November. The project was cosponsored by the DPLA, ND Grain Growers Association and several western ND grain and livestock producers. Grant funding in support of this project has been provided by the DPLA and the ND Agricultural Products Utilization Commission.

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