



FIELD PEAS AS FEED FOR LIVESTOCK

An incredible new feed grain has recently been recognized for its potential contribution to the livestock industry. Field pea (*Pisum sativum*) is an annual cool-season grain legume grown predominantly in the Northern Plains with significant potential as a feed for livestock. North Dakota and Montana lead the nation in field pea production. Field peas that do not make the quality specifications for human food have significant market potential as a livestock feed. Field peas and pea-cereal grain mixtures can be grown for forage (hay or silage) and pea residue after grain harvest can be fed to ruminant animals.

Regional interest in peas as feed

Several research trials have been conducted to investigate field peas in livestock diets at North Dakota State University and at other regional universities. Peas can be used effectively and efficiently in several different types of livestock diets including beef and dairy cattle, sheep, bison, swine, and poultry. The unique and thorough digestion parameters of peas make it a safe and nutritious feed grain for all species.

Nutritional value of field peas

The field pea is a nutrient dense grain (60 lb/ bushel) with energy equal to corn on a weight basis and nearly three times the crude protein. Both starch and fiber components are energy sources.

Palatability and digestibility of field peas are positive attributes of this grain legume. Since field peas ferment slower and more thoroughly than some other feed grains, stable and efficient rumen function is maintained. These traits may serve to keep animals "on feed" during stress periods and improve growth rate and feed efficiency over other ration ingredients.

Field peas have excellent binding characteristics in the manufacture of pellets or range cow cakes. Peas increase the durability and reduce the fines when used in formulations at 10%-40% of the feed product. In addition, peas add critically important rumen degradable protein to cake for wintering

cows that are consuming low quality forage. Peas are also an excellent ingredient in creep feeds. Cow-calf producers are asking for peas in their creep feed and in their range cake because they see value in the palatability and animal performance.

"Peas are an excellent source of natural protein. I use them in diets for developing purebred bulls and in creep feed for calves."

Dewayne L. Siebrasse, President, Nutritional Consultant, CattleCents Consulting Inc., Aberdeen, SD.

Field pea research

Including field peas in beef cattle rations has supported equal weight gain with improved feed efficiency in some cases or improved intake and weight gain compared to traditional feeds. Peas are best used in diets where palatability and nutrient density are critically important, such as creep feeds or weaned calf rations. We observed similar and positive results for feeding feed grade field peas, chick peas or lentils to newly weaned calves. Cattle made the best use of rolled peas vs. whole or finely ground grain.

Feeding peas is highly recommended in weaning and growing rations with 20%-30% peas in the diet. Finishing feedlot cattle can benefit from peas as a protein source, especially in corn based diets. Peas fed at 15% of a well formulated diet generally provide enough protein to realize the genetic potential of our modern feeder cattle. A highly interesting response has been observed when peas are fed to finishing steers. Carlin et al. (2006) reported that inclusion of 10% or more field peas in the ration for 75 days increased the tenderness and juiciness of ribeye steaks. More details on this highly positive and the very unique effect of field peas in beef cattle diets will be provided in future articles.

Field peas can be used very successfully in rations for dairy cattle and sheep, replacing some of the concentrate while adding supplementary protein.

Lactating dairy cattle require high levels of protein and unique contribution of both energy and protein from peas make it an ideal feed for milking cows. In sheep finishing diets, field peas included at up to 45% of the ration resulted in a highly acceptable replacement in corn based diets producing exceptional growth of lambs. In non-ruminants such as swine and poultry lower inclusion such as 10%-30% of diets may be used successfully depending on stage of production.

Conclusion

Field peas are a nutrient dense grain legume and an excellent feed for many different classes and production scenarios of livestock. Used as a protein source or replacement concentrate grain, livestock producers have an opportunity to utilize this unique and beneficial feed ingredient.



Table 1. Comparison of nutrient value of livestock feed grain with field peas.

Item	Field peas	Corn	Barley
Dry matter, %	89	88	88
% Dry Matter			
Crude protein, %	25.5	9.8	13.2
Total digestible nutrients, %	87.0	90.0	85.0
NEg, Mcal/lb	0.67	0.68	0.63
Rumen undegradable protein, %	30.0	60.0	27.0
Calcium, %	0.15	0.03	0.05
Phosphorus, %	0.44	0.31	0.35
Fat, %	1.40	4.30	2.20

Adapted from Anderson et al., 2007. AS-1301 and NRC, 1996.

Table 2. Field pea grain, pea co-products and pea forage nutrient analysis.

Item	Pea Grain	Pea Hulls	Pea Screenings	Pea Hay	Pea Straw	Pea Silage
Dry matter, %	88	92	90	88	89	35
% Dry Matter						
Crude protein, %	25.5	9.0	23.6	13.6	8.5	15.4
Total digestible nutrients, %	87.0	60.0	80.0	58.0	46.0	58.0
NEg, Mcal/lb	1.02	0.59	0.88	0.56	0.38	0.57
NEg, Macl/lb	0.67	0.33	0.59	0.27	0.13	0.31
Calcium, %	0.15	0.48	0.14	1.39	1.62	1.32
Phosphorus, %	0.44	0.09	0.48	0.28	0.11	0.22

Adapted from Lardy et al., 2009. Alternative Feeds for Ruminants. AS-1182 p. 21.



USING FIELD PEAS IN BEEF COW/CALF OPERATIONS

North Dakota and Montana have led the nation in field pea production for the past several years. Field peas that do not make grade for the human food market can be marketed as excellent quality feed livestock. Beef cattle are the primary livestock enterprise in the region and can utilize significant amounts of peas. There are several different production scenarios in the cow/calf enterprise where peas can be used to advantage. Peas make a palatable and highly digestible supplement for wintering beef cows on low quality forage. Field pea and cereal grain (forage barley or oats) grown together can be harvested as dry hay or ensiled to provide high quality forage. Pea residue is also useful to beef cows but the nutrient density is not

as high as the pea hay or silage. After grain harvest, a second crop of peas may be possible for forage if light tillage follows the combine and moisture is available. This forage can be grazed, or possibly cut for hay or ploughed down as a green manure.

"I feed peas before weaning to cows and calves. I mix peas with chopped hay and silage so calves are used to feed at weaning. Then I use peas in the weaning ration and the calves continue to eat well. At weaning, the cows beller but the calves just eat."

Burdell Johnson,
Livestock producer,
Tuttle, ND.

Field peas in beef cow rations

Peas provide a highly rumen degradable protein source required by beef cows. The rumen degradable protein supports healthy microbial populations that can digest forage more thoroughly. Energy from starch and digestible fiber further supports ruminal digestion. Use of home-grown peas for winter supplementation can reduce purchased feed inputs and transportation costs and improve crop rotations. There was a tendency for improved beef cow performance with processed peas (dry rolling) over whole peas when fed as a supplement to forage diets. The rate of passage in high forage diets reduces time for digestion of whole peas. Mature beef cows chew their "cud" which may be thorough enough for nominal nutrient utilization.

Field peas for developing bulls

There is no formal research evaluating the use of field peas for developing breeding bulls, however, experience from some exceptional seedstock producers indicates a strong preference for field peas in growing bull rations. Some seedstock operations include peas in their bull grower diets and like the positive effect on muscle development and feet and legs. The slow and thorough digestion of field peas may contribute to this positive effect. In addition, bulls are said to be more satisfied. Some producers grow their own peas like Gelbvieh breeders, Louis and Rob Arnold from Esmond, ND. Others contract or purchase peas from area farmers. The long term use of peas by producers selling exceptional beef genetics is testament to the value of field peas in this production scenario.

Using peas to manufacture cake and pellets

Peas are an excellent binder for the manufacturing of high quality pellets or for range "cakes" or cubes, which are essentially a large diameter pellet. Cake products and pelleted feeds formulated with other co-products can use peas to add hardness and durability. Some livestock producers are asking their feed suppliers specifically for peas in their creep feed and/or cow cake as they recognize the palatability and excellent animal condition observed from feeding peas.

Field peas in creep feed

The palatability, digestibility, and nutrient density of field peas provide for a unique ingredient in creep feeds. Calves grew fastest with peas in the creep feed. Our current recommendation is to use 20%-40% field peas in creep formulations. Peas should be processed by dry rolling in home formulated creep feeds.

Concluding thoughts

Field peas are an excellent feed for beef cows, calves, and bulls. Used as a protein source or energy concentrate, regional producers have a very palatable and economical feed available to them. Creep feed and bull development rations can use peas as an ingredient in the formulation for excellent animal performance.



"My Angus bulls seem to be more complacent when I include peas in the growing ration"
Justin Spickler,
Spickler Angus,
Glenfield, ND.

Table 1. Field pea coproducts and forage nutrient analysis.

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NEm, Mcal/lb	1.02	0.59	0.88	0.56	0.38	0.57
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"Peas have a calming effect on my animals, they seem more satisfied, both cattle and sheep." Burdell Johnson, Livestock producer, Tuttle, ND.

USING FIELD PEAS IN FEEDLOT RATIONS

The world needs more field peas! Rarely, if ever, has a newly rediscovered feed grain provided as much nutritional value and producer interest as field peas. Field peas are highly digestible and very palatable to cattle. There are a number of beef production segments that can utilize field peas to promote optimum growth and production. This article focuses on the use of peas as an ingredient in beef cattle rations from weaning to market.

The value of peas as feed

The nutrient content of peas relative to the nutrients and price of other feeds affects the market for feed peas. When corn is priced at \$3.50 per bushel and canola meal is \$175 per ton, field peas are worth \$4.94 per bushel. So purchasing peas for less than \$4.94 gives the livestock producer increased profit potential, plus reduces the logistics of handling two feed products. A bushel of peas weighs 60 lbs, vs. 56 lbs for corn. There is no additional value given to peas in this calculation for the excellent palatability and digestibility which contribute to improved animal performance. Corn and canola meal were selected for comparison as commonly available feed ingredients in our region with canola meal having the same primary site of digestion for protein, primarily in the rumen. Field peas co-products (screenings, chips, and splits) plus off-quality or damaged pea grain easily compete with other feeds and are available in the region.

Field peas in weaning and growing rations

Due to the high energy (equal to corn) and protein value (nearly 3 x corn) peas are best utilized in diets where nutrient density is very important, where every mouthful contains the maximum energy and protein. Weaned calves are stressed in many ways, so supporting the immune system with optimum nutrition helps maintain healthy animals. Calves fed peas in a mixed ration for 56 days starting at weaning gained significantly more than calves fed the control diet, and continued to gain more per day for several weeks after peas were removed from the ration. Steers in this study were fed a control diet or peas, chickpeas or lentils at 17% of the diet. Pulse fed steers consumed 1.3 pounds more feed per day and gained 0.4 lbs more per day. Feeding peas to calves at weaning makes good logistic sense as well, as peas are harvested just prior to the time of weaning. Weaning diets should contain a mixture of good quality forage and concentrate with appropriate vitamin and mineral supplements. The energy level can vary based on gain goals and future feeding scenario. But a few pounds of rolled peas, or rolled peas mixed with rolled corn is good nutritional insurance to get calves started on feed and keep them healthy. Peas are a critical ingredient to get calves to gain rapidly and efficiently after weaning.

Peas in feedlot finishing diets

Peas fed at 15%-20% of the diet will generally meet the protein needs of finishing cattle, although peas can be fed as the entire grain portion of the ration if the cost is competitive. Finishing cattle fed peas either ate more and gained faster or ate less and gained the same resulting in increased feed efficiency.

We have observed that peas and corn fed together are highly complimentary. Both have slow and thorough fermentation patterns, and together provide a balanced protein digestion pattern that includes both rumen degradable and undegradable protein. The net result of several experiments is that peas are a very useful feed for beef cattle in the backgrounding and finishing feedlot phases.

Processing Peas

Feedlot cattle fed rolled peas ate 1.5 pounds more feed per day and gained 0.37 pounds more per day than cattle fed ground or whole peas. Coarse grinding can be done but it is more difficult to control the particle size and over processing will create small particles or fines. Chips or splits purchased from pea processors do not require any further processing.

Conclusion

Weaned calves should be fed a minimum of 15% dry rolled field peas in a diet that may include other grains, hay, silage and mineral and vitamin supplements. There is essentially no maximum based on the biology of the animals, but feed cost may limit the amount of peas fed. Peas compliment corn very well in growing and finishing rations with similar fermentation profiles. The next article in this series addresses the surprisingly positive effect of peas on the eating satisfaction of beef.



“Peas are very user friendly; cattle take to them because they taste good and smell good. The ranchers want cake with peas and we have producers asking for creep feed with peas in it.”
Dennis Wendell,
LaMoure Feed
and Seed.



Table 1. Equivalent price of field peas based on nutritional content compared to corn and canola meal

		Corn, \$/bushel						
		2.00	2.25	2.50	3.00	3.50	4.00	
Canola	125	3.53	3.64	3.75	3.86	3.96	4.07	
Meal	150	4.03	4.13	4.24	4.34	4.43	4.55	
\$/ton	175	4.52	4.63	4.73	4.83	4.94	5.04	
	200	5.02	5.12	5.23	5.33	5.44	5.54	



THE ULTIMATE EATING EXPERIENCE - PEA FED BEEF

Do you want to eat the very best beef on the face of the earth?

"Pea-fed beef" is a phrase that is getting increasing attention. Pea growers in North Dakota observed that there was something special about the butcher beef they fed peas to. Scientists validated this observation through research at the NDSU Carrington Research Extension Center and the Animal Sciences Department at North Dakota State University. In the past few years, some consumers have developed a "cult-like" passion for pea-fed beef, searching for beef feeders and butcher shops where they can buy pea-fed beef for their freezers. This is not to discredit the high quality beef currently available in our butcher shops and grocery stores, often exceptional quality local beef from area feeders.

"I always thought pea fed beef was tender and juicier with more flavor and research at Carrington REC and NDSU has proven it."

Burdell Johnson,
Livestock producer,
Tuttle, ND.

How to feed peas to improve tenderness and juiciness.

Feeding dry rolled peas at 10% of the corn based finishing diet for 75 days before market resulted in significantly improved tenderness and juiciness vs. cattle not fed peas. Feeding more peas (20%-30% of the diet) did not significantly improve tenderness and juiciness. The University of Nebraska has observed the same improvement in tenderness as well as improved flavor in beef fed peas using the same protocol as conducted at the Carrington Research Extension Center. More research is planned to explore the minimum amount of peas needed and the length of time required to achieve the pea-fed beef effect. Research is also underway to evaluate what components of the field pea cause the tenderness and juiciness effect and if other muscles in the carcass are affected.

How pea-fed beef is tested.

Growing and finishing steers are fed diets with and without peas, different amounts of peas, or peas at different times in the feeding period at the Carrington Research Extension Center. Animals in the research trials are harvested humanely and meat samples collected from the carcass of each animal at the abattoir. Pea-fed beef steaks are tested at the Animal Science Dept. meats laboratory with a mechanical slicing process called the "Warner-Bratzler shear test". This test measures the pressure on a knife blade to cut muscle samples. Normally, a person consuming a steak can detect a reduction in shear pressure of about a half-pound as improved tenderness. The mechanical test for tenderness for pea-fed beef was equivalent to an improvement of approximately 1.5 pounds, a very strong indication of more tender beef. A second, more subjective testing method uses a human "taste panel". Eating steak for research is tough duty, but somebody has to do it!!!! Pre-screened people rate each steak sample as to juiciness, tenderness, flavor and off-flavor. Not all trials observed the significantly improved tenderness as there may be a biological limit and some cattle are genetically predisposed to be very tender. We have theorized that pea-fed beef is a way of "insuring" eating satisfaction. The biological mechanism of why peas increase the tenderness or juiciness of beef is not known but being investigated.

Pea-fed beef demand and supply.

Tenderness has been rated as the NUMBER 1 factor in consumer surveys for eating satisfaction for beef. We know that feeding field peas assures tender beef. Any improvement in juiciness and flavor are bonus positive factors. Skeptics who have tried pea-fed beef ribeye steaks have been convinced of the improvement in eating satisfaction, notably the tenderness and juiciness. The publicity given the pea-fed beef research has generated significant interest from consumers and the restaurant industry. Collaboration is needed between feedlot(s) that can source and feed peas and small (or large) butcher shops that can provide consumers with the best beef in the world. Purchasing a supply of peas to use in finishing cattle for a new specialty pea-fed beef market is possible but takes some planning. Producers who grow their own peas may have an opportunity to sell pea-fed beef off the farm.



For sources and other info see
www.northernpulse.com

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