REVIEW: Field Pea Grain for Beef Cattle

V. L. ANDERSON,*1 PAS, G. P. LARDY,† and B. R. ILSE*
*Carrington Research Extension Center, North Dakota State University, Carrington 58421; and Department of Animal and Range Sciences, North Dakota State University, Fargo 58105

ABSTRACT

Field pea (Pisum sativum) grain is a nutrient-dense grain legume that is a palatable source of CP (25.3%), energy (1.48 NE\textsubscript{g} Mcal/kg), and other nutrients for beef cattle. Field pea grain is highly digestible, but the starch fermentation and ruminal protein degradation rates are slower than for several other common feeds. Increased DMI has been observed in some studies with the inclusion of field pea grain in the ration. Apparently field pea grain does not need to be processed for beef cows. In backgrounding and finishing rations, processing field pea grain has produced mixed results, but dry-rolling may contribute to improved animal performance. In creep feeds, 30 to 40% field pea grain (DM basis) may be optimum for animal performance. The inclusion of field pea grain in postweaning receiving rations has resulted in increased DMI. As a protein supplement for feeder cattle, field pea grain can be included at 15 to 30% of the ration (DM basis); however, growing and finishing cattle can utilize field pea grain as both a protein and energy source. Inclusion of field pea grain at a minimum of 10% of the finishing diet improved the tenderness and juiciness of beef without affecting carcass traits. Field pea grain is an excellent pellet binder. Beef cattle producers with access to field pea grain at competitive prices should consider using this grain legume in their ration formulations.

Key words: field pea, beef cattle, feedlot, creep feed

INTRODUCTION

Field pea is one of several pulse crops (from Latin \textit{pultis}, meaning thick soup) defined as the dried, edible seeds of legumes that are used as food and also include dry bean, lentil, chickpea, and fababeans. Production of field pea has increased dramatically in the last 5 yr across the Northern Plains states (USDA-NASS, 2005b) as farmers include this annual grain legume in crop rotations to reduced reliance on purchased fertilizer inputs. The expanding supply of field pea grain creates an opportunity to utilize this new feed in commercial livestock production. Field pea grain is an energy- and protein-dense feed-stuff (Table 1) with energy content similar to corn (Loe et al., 2004). Crude protein content has varied from 17% (Bock and Anderson, 2001) to 26.7% (Wang and Daun, 2004) based on variety, growing conditions, and other factors, but the typical range is 23 to 25% (Larry White, Northern Pulse Growers Assn., personal communication). Commonly fed as a protein source, this grain legume will increase the energy density of most diets as field pea grain contains more energy than many common protein supplements such as oilseed meals or crop processing coproducts. The standard density for field pea grain is 77.22 kg/hL (60 lbs/bu; USDA-FSA, 2005). Beef cattle producers are the largest potential market for field pea grain in the United States. In Europe, field pea grain has been used for ruminants, especially as a protein source in silage-based diets (Weiss and Raymond, 1989).

Field pea grain may best be utilized in scenarios where nutrient density and palatability of the diet is important, such as in creep feeds or receiving diets, as a component of feedlot diets, or as supplementation of grazing livestock. Commercial feed manufacturers are including field pea grain in a number of commercial products because of the nutrient density, palatability, competitive price, and to act as a binding agent for pelleted feeds (K. Koch, Northern Crops Institute, personal communication). Field pea can also be harvested as forage for hay or silage, but it is an annual crop. In this role, it is commonly intercropped with a cereal grain such as oats or barley. There is substantial research data on field pea grain, as well as considerable positive producer experiences with feeding this legume grain. This review paper is the first to summarize research on the feeding characteristics of field pea as it specifically relates to beef cattle and gives recommendations on feeding this increasingly popular grain legume.

\footnote{1Corresponding author: vern.anderson@ndsu.edu}
DISCUSSION

Field Pea Grain Use

The northern United States and Canadian prairie provinces are known as cow-calf production areas with recent increases in feedlot enterprises. This is the geographic area where peas are primarily grown (USDA-NASS, 2005b; Statistics Canada, 2006). The greatest potential use of field pea grain is feed for cattle at different stages of production; however, peas will have to compete with feeds such as barley, corn, wheat middlings, distillers grains, oil seed meals, and other commodities.

Feed Intake

Palatability is critical to starting calves on feed during creep feeding or in feedlot receiving diets. In most studies, cattle consumed greater quantities of rations that included field pea grain. A North Dakota creep feed study observed a linear increase (Anderson, 1999a) in DMI with increasing levels of field pea grain at 0, 20, and 40% of diet DM, but DMI decreased at 59% in a Nebraska finishing study (Fendrick et al., 2005b). No effects on gain and carcass traits were noted in the Nebraska study. With pea levels at 0, 8.8, 17.5, and 26.3% of diet DM in a corn silage-based growing diet, DMI increased linearly with pea level, but gain and feed efficiency were not affected (Flatt and Stanton, 2000). Weiss and Raymond (1989) conducted a series of studies using silage-based diets in Europe and reported that diets containing field pea grain were consumed at 102% of the level of diets containing soybean meal. In contrast to the above studies, a Colorado State University study (Flatt and Stanton, 2000) fed increasing levels of field pea grain (0, 5, 10, and 20% of ration DM) in finishing diets for beef steers with a linear decrease in DMI observed. However, gains were similar, and feed efficiency improved with increasing level of field pea grain. In creep feed, receiving, or growing diets, DMI is equal or greater with pea grain in the diet whereas during finishing, diets with peas were consumed at equal or lower DMI but gains were not affected.

Rumen Degradability

Field pea protein is a highly rumen degradable protein (RDP). Estimates of RDP range from 78 to 94% (Aufrere et al., 1994; NRC, 1989; unpublished data from our laboratory) leaving modest amounts as rumen undegradable protein (RUP). However, the disappearance rate for pea protein was slower during the first 6 h (1.6%/h) than for soybean meal (4.5% /h; Lindberg, 1981) but increased thereafter. The more slowly and thoroughly degraded protein fraction in field pea grain may be beneficial for growth of rumen microbes and therefore may be a positive influence on forage digestion and gain efficiency. Processing field pea grain by dry- or temper-roasting did not change rumen degradability of protein until the grain was roasted for 12 min at 149°C (Gilbery et al., 2005). Maximum reduction in ruminal protein degradation was observed when field pea grain was toasted at 150°C for 30 min (Lijk et al., 2003). However, Aguilera et al. (1992) achieved a significant reduction in ruminal degradation at 64°C for 30 min. Extrusion decreased ruminal degradation of field pea grain at 140°C (Focant et al., 1990; Walhain et al., 1992; Goelema et al., 1999); however, ruminal protein degradation increased with pelleting (Goelema et al., 1999) and extrusion (Aufrere et al., 2001). Steam flaking had no effect (Focant et al., 1990). There appears to be some varietal differences in RUP of pea grain (Table 2; unpublished data from our laboratory). It is not practical to process field pea grain at high temperatures for long periods of time unless animal performance or feed efficiency will improve net return. Animals with high requirements for metabolizable protein may require more RUP than provided by field pea; in this case, heat treatments may be more economical.

Starch in field pea grain degrades more slowly in the rumen than wheat or barley starch and at about the same rate as starch from corn (Robinson and McQueen, 1989; McQueen and Robinson, 1991). Starch degradability is not increased by heat treatments, such as flaking (Table 2; unpublished data from our laboratory). It is not practical to process field pea grain at high temperatures for long periods of time unless animal performance or feed efficiency will improve net return. Animals with high requirements for metabolizable protein may require more RUP than provided by field pea; in this case, heat treatments may be more economical.

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Weiss and Raymond, 1989). Total tract starch digestibility was similar when field pea grain replaced dry-rolled corn in medium concentrate growing diets for beef steers (Reed et al., 2004b). The fermentation rate for pea protein and starch in the rumen may contribute to a more stable rumen environment.

**Pelleting Field Pea Grain**

In addition to adding nutrient density to commercial feeds that use high proportions of fiber-based ingredients, field pea grain is an excellent binding agent for pelleting formula feeds. However, field pea grain is difficult to pellet alone as the binding properties reduce processing rate. Pellet quality and processing rate are generally satisfactory when field pea grain is included at 20 to 60% of a feed formulation (K. Koch, Northern Crops Institute, personal communication).

**Effect of Variety and Color**

Protein content varies due to variety, yield, soil type, fertility, temperature, rainfall, and planting date. A trial compared the varieties (v.) Profi and Integra (24% vs. 17% CP, respectively; Bock and Anderson, 2001) suggested there are animal performance differences due to varieties even though the control diet contained CP levels recommended by NRC (1996). There are no data comparing green and yellow varieties to date.

We have investigated the effect of variety on in situ CP disappearance (Table 2; unpublished data). Differences exist between varieties for many nutritional characteristics, including rate and extent of ruminal degradation. This may be more important in situations where nutrient requirements are high (e.g., high-producing dairy cows). In particular, v. Trapper had slower rates of ruminal degradation and lower degradability estimates than v. Profi, Arvika, and Carneval. Additional research and selection is needed on the nutritional characteristics of different field pea varieties and the effects on animal performance.

**Creep Feed Research**

In a 2-yr study with 128 cow-calf pairs (Anderson, 1999a), wheat middlings and field pea grain were offered in 4 reciprocal, creep feed combinations to determine an optimum level of field pea grain. Treatments were reciprocal amounts of dry-rolled field pea grain and pelleted wheat middlings at 0 and 100%, 33 and 67%, 67 and 33%, and 100 and 0%, respectively. Field pea grain was coarsely rolled and wheat middlings were fed as 6.35-mm diameter pellets. Dry matter intake increased linearly with increasing level of field pea grain in the diet during the 56-d study. Calf ADG increased from 1.28 kg at 100% middlings to 1.41 kg at 33% field pea grain at 1.44 kg at both 67 and 100% field pea grain. Feed efficiency decreased with increasing pea levels. These data suggest that the best inclusion rate for field pea grain in beef creep feeds is between 33 and 67%.

A study (Landblom et al., 2000) that limited intake of creep feeds that contained field pea grain included up to 16% salt as the intake limiter. Eighty cow-calf pairs were used to compare 4 treatments including 1) no creep feed, 2) 33% field pea grain, 3) 67% field pea grain, and 4) 100% field pea grain. Peas replaced wheat middlings in these creep feed formulations. Daily DMI was approximately 1.36 kg/head for all creep rations. Gains tended to be greater for creep feed vs. no creep feed. No differences were observed due to level of field pea grain.

Creep feeds formulated with 18 or 50% field pea grain produced equal calf gains when DMI was limited to 1.86 kg using 16% salt (DM basis) in a season-long grazing study (Gelvin et al., 2004). Salt added at only 8% (DM basis) of a creep feed containing 55% field pea grain resulted in greater DMI, but no differences in gain or gain efficiency were observed.

Gelvin et al. (2004) also utilized ruminally cannulated nursing steer calves to investigate the effects of a field pea grain-based creep feed on ruminal fermentation characteristics, forage intake, and digestibility while calves grazed native rangeland. No differences in forage intake were noted. However, calves supplemented with field pea grain creep feed had greater total DMI than control calves. Supplementation decreased ruminal pH but increased ruminal concentrations of volatile fatty acids and ammonia.

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**TABLE 2. Effect of field pea cultivar on in situ protein degradation characteristics**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cultivar</th>
<th>Profi</th>
<th>Arvika</th>
<th>Carneval</th>
<th>Trapper</th>
<th>SEMb</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP, % (DM basis)</td>
<td></td>
<td>22.6</td>
<td>26.1</td>
<td>22.6</td>
<td>19.4</td>
<td>—</td>
</tr>
<tr>
<td>0-h N disappearance, %</td>
<td></td>
<td>54.3c</td>
<td>53.0d</td>
<td>47.4d</td>
<td>32.0c</td>
<td>5.65</td>
</tr>
<tr>
<td>Slowly degradable, %</td>
<td></td>
<td>45.7c</td>
<td>47.0c</td>
<td>52.6c</td>
<td>68.0d</td>
<td>6.00</td>
</tr>
<tr>
<td>Rate of CP digestion, %/h</td>
<td></td>
<td>14.6c</td>
<td>8.6d</td>
<td>10.5c</td>
<td>7.3c</td>
<td>0.26</td>
</tr>
<tr>
<td>Estimated RDP, % of CP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k' = 0.02</td>
<td></td>
<td>93.4d</td>
<td>91.5d</td>
<td>92.7d</td>
<td>87.4c</td>
<td>2.05</td>
</tr>
<tr>
<td>k' = 0.04</td>
<td></td>
<td>88.2d</td>
<td>85.4d</td>
<td>86.6d</td>
<td>77.7c</td>
<td>3.29</td>
</tr>
<tr>
<td>k' = 0.06</td>
<td></td>
<td>84.3d</td>
<td>81.0d</td>
<td>82.0d</td>
<td>71.0c</td>
<td>4.02</td>
</tr>
</tbody>
</table>

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*aAdapted from unpublished data in our laboratory.

b *n* = 4.

cRow means with different superscripts are different (*P* < 0.02).

RDP = rumen degradable protein; *k’* = ruminal outflow rate (per hour).
Nursing beef calves were fed creep diets formulated with 40% ground, rolled, or whole field pea grain in a 56-d trial at the North Dakota State University Carrington Research Extension Center (Anderson et al., 2006). Dry matter intake was not affected by processing treatment, but calf daily gains were numerically greatest with rolled field pea grain (1.50 kg/head) compared with ground (1.41 kg/head) or whole (1.42 kg/head) field pea grain. Creep feed with field peas appears to be more palatable and improve animal growth.

**Research in Receiving Rations**

Dry-rolled field pea grain was fed at 28 and 56% (DM basis) of receiving diets to 294 head of newly weaned calves from 34 different ranches (Anderson and Stoltenow, 2004). Dry-rolled barley and canola meal were used as basal ingredients in the control diet. The 60% concentrate isonitrogenous diets also included corn silage and mixed hay. Daily intake increased linearly with increasing pea level (6.62, 7.03, and 7.48 kg/head, respectively, for 0, 28, and 56% field pea grain) during the 42-d receiving study. Daily gains were greater for the 56% pea diet (1.60 kg) compared with the 28% pea diet and the control, which were the same (1.50 kg).

Dry-rolled pulse grains (field pea, chickpea, or lentil) were fed as the protein sources at 17% of DMI compared with canola meal in 4 isonitrogenous receiving diets (Anderson and Schoonmaker, 2004). Freshly weaned calves (n = 172) from 39 North Dakota ranches were allotted randomly by ranch to 16 pens for the 42-d trial. The 60% concentrate rations included dry-rolled corn, corn silage, and chopped mixed hay. Diets were formulated to provide 240 mg monensin (Elanco Animal Health, Greenfield, IN) per head daily. Daily matter intake increased from 6.80 kg/d for the control to 7.39 kg/d for each of the 3 pulse grain treatments. Daily gains were equal for the 3 pulse treatments (1.85 kg) and greater than the control diet (1.67 kg). At the end of the receiving study, calves were placed on a common corn-based finishing diet and fed to slaughter weight. Calves previously fed pulse grains continued to gain faster (1.83 kg/d for the 3 pulse diets vs. 1.57 kg for the control diet) for 7 wk following the conclusion of the receiving study. This carryover effect attributed to the inclusion of pulse grains in receiving diets is interesting and warrants further study. Pea grain in receiving diets appears to increase DMI and gain.

**Growing Studies**

Field pea grain is widely used by cattle producers as a protein supplement for wintering ranch-raised calves. The optimum level of field pea grain in a forage-based diet was investigated by Reed et al. (2004a). Field pea grain was offered at 0, 0.81, 1.62, and 2.43 kg/head to steers consuming medium-quality grass hay in a 4 × 4 Latin square design. Total DMI and OM intake increased with increasing level of field pea grain. As expected, forage DMI decreased with increasing field pea grain level. Ruminal volatile fatty acids, total tract CP digestibility, and apparent ruminal DM digestibility tended to increase linearly with increasing field pea level. Field pea grain had no effect on total tract DM or OM digestibility. Reed et al. (2004a) concluded that field pea had similar effects to cereal grain on forage intake, ruminal fermentation, and digestion when supplemented in medium-quality forage-based diets.

Anderson (1999b) also investigated the use of field peas as a dietary ingredient for growing calves. In this study, weaned crossbred steer calves were fed 1 of 3 60% concentrate diets. The concentrate treatments were 1) dry-rolled barley with canola meal at CP levels recommended by NRC (1996), 2) dry-rolled field pea grain as the only concentrate source fed at the same as percentage as concentrates in treatment 1, or 3) dry-rolled barley with increased canola meal proportion to equalize the CP level of the treatment 2 pea grain diet. Treatment 2 and 3 diets both contained 16.28% CP (DM basis) and exceeded published requirements of 13.7% CP (NRC, 1996). Dry matter intake of the field pea diet was 112.3% of the control and 109.3% of the barley plus canola meal treatments, respectively. Daily gains from the pea grain diet were also numerically greater than the barley treatment (116.8%) and barley plus canola meal (107.0%).

In a Nebraska study, calves were fed diets containing 69% corn silage (DM basis) with rolled field pea grain at 0, 8.8, 17.5, and 26.3% of intake replacing corn grain (Fendrick et al., 2005b). Dry matter intake increased linearly with pea level but no differences in gain or gain efficiency were observed, although gains were 105% of control for the 26.3% field pea grain treatment.

Field pea grain was substituted for grain milling coproducts (soybean hulls, barley malt sprouts, and wheat middlings) at 0, 15, 30, and 45% of DMI in a 4 × 4 Latin square study (Soto-Navarro et al., 2004) utilizing 4 multicannulated steers. The diets contained 45% grass hay and 55% concentrate. Dry matter intake decreased with increasing pea level. Starch digestion decreased with increasing pea level, but digestibility of OM, ADF, and NDF was not affected.

In diets containing 50% concentrate (DM basis), corn silage, and alfalfa hay, Reed et al. (2004b) replaced corn as the concentrate with field pea grain at 0, 33, 67, and 100% in the 4 × 4 Latin square study using 4 multicannulated steers. Dry matter intake was not affected, but ruminal fill and ruminal pH decreased with increasing pea level. Ruminal ammonia, total tract volatile fatty acid concentrations, and total OM, NDF, and ADF disappearance all increased with increasing pea level. Starch digestion was not affected. In western North Dakota, growing heifer calves were fed field pea grain as an isonitrogenous replacement for barley and soy-
bean meal with no effect on DMI, ADG, or gain efficiency (Poland and Landblom, 1998). In another study reported by Poland and Landblom (1998), performance was similar, but DMI decreased in a field pea diet, which tended to improve gain efficiency. Field pea grain was used as a protein source compared with soybean meal in silage-based diets in several European trials (Weiss and Raymond, 1989). In 5 trials, DMI and gain from field pea grain-supplemented diets averaged 102% of control, but gain efficiency was similar.

A growing trial included 40% (DM basis) ground, rolled, or whole field pea grain in 60% forage rations (Bock et al., 2000). Seven steers were assigned to each of the 3 treatments and individually fed in Calan head-gates (American Calan, Inc., Northwood, NH). No differences were observed for DMI, but a quadratic response for ADG was observed associated with particle size. Calves fed ground peas gained 1.64 kg/d, rolled peas resulted in a gain of 1.53 kg/d, and whole peas produced a gain of 1.70 kg/d during the 84-d study. Field pea grain can be used effectively in growing diets with potential to improve intake and gain or contribute to greater feed efficiency.

**Finishing Experiments**

Steer calves (n = 83) were fed totally-mixed finishing diets with dry-rolled barley and canola meal or field peas as the only grain source in the 85% concentrate diets (Anderson, 1999b). Compared with a barley-based diet, DMI was numerically greater (104.7%) as were gains (105.5%) for the field pea diet with similar gain efficiency observed. Marbling scores and the percent USDA Choice carcasses were greater for steers fed field pea when animals were slaughtered at the same time. Whole field pea grain was fed at 0, 20, 40, and 59% of finishing diets (DM basis) to 129 yearling steers in a Nebraska study (Fendrick et al., 2005a). Dry matter intake increased with increasing pea level up to 40% and decreased at 59%. Average daily gain, gain efficiency, and carcass traits were not different. In another Nebraska finishing study with 206 steers (Fendrick et al., 2005b), no differences were observed between dry-rolled or whole peas fed at 15 or 30% of the diet DM replacing corn.

Field pea grain was used as a protein supplement at 10% (DM basis) of the finishing diet replacing corn and soybean meal (Birkelo et al., 2000). No differences were observed in any of the overall feedlot performance or carcass traits measured; however, during the first 56 d on feed, improved gains and gain efficiency were observed for the cattle fed field pea grain.

Flatt and Stanton (2000) fed field pea grain at 0, 5, 10, and 20% (DM basis) of finishing diets to steers and heifers substituting field pea grain for soybean meal. The field pea variety Profi used in this trial was 20% CP. Increasing field pea grain decreased DMI but did not affect gain, thereby improving gain efficiency linearly with increasing field pea level. Carcass traits were not affected. Mortality was lower for the calves fed field pea (0.75%) compared with the control diet (6.75%).

Anderson et al. (2006) compared 3 processing treatments for field pea grain (ground, rolled, or whole) using 112 feeder heifers fed diets with peas at 28% of diet DM. Particle size of ground peas averaged 700 µ, rolled peas averaged 3,100 µ, and whole peas averaged 7,520 µ. Dry matter intake was greatest for heifers fed rolled pea grain (10.34 kg) compared with ground (9.62 kg) and whole (9.67 kg) pea treatments, which were similar. Average daily gain was greatest for rolled peas (1.54 kg) compared with whole peas (1.34 kg), with ground peas (1.34 kg) intermediate. Gain efficiency was similar for all treatments.

Llo et al. (2004) utilized lambs to estimate the net energy value of field pea grain in finishing diets. In 2 research trials with 200 crossbred lambs, field pea grain replaced corn and at graded levels. The NEₙ value of field pea grain was estimated at 2.75 and 2.02 Mcal/kg, respectively. These values are 14% greater than corn.

**Carcass Traits and Taste Panel Response**

Feedlot heifers (n = 118) were fed increasing levels of dry-rolled field pea grain (0, 10, 20, and 30% of DM intake; Carlin et al., 2006). No differences due to treatment were observed for DMI, ADG, gain efficiency, or USDA quality or yield grade. Samples of the anterior end of the shortloin (7.62 cm) were collected for Warner-Bratzler shear force evaluation and for evaluation by a trained taste panel for sensory attributes. Increasing level of field pea grain quadratically decreased Warner-Bratzler shear force (4.30 ± 0.15 kg, 3.63 ± 0.15 kg, 3.68 ± 0.16 kg, and 3.71 ± 0.15 kg for 0, 10, 20, and 30 % levels, respectively). Sensory panel analysis indicated a linear increase in tenderness with the addition of field pea grain (4.56 ± 0.18, 5.14 ± 0.17, 5.28 ± 0.18, and 5.34 ± 0.18 for 0, 10, 20, and 30% levels, respectively). Sensory panel ratings also indicated a tendency for increased juiciness and no differences in flavor or off-flavor due to increasing level of field pea grain. These responses indicate that the inclusion of field pea grain in finishing diets may positively affect consumer enjoyment of beef and warrant further investigation.

**Beef Cow Supplementation Research**

There is little research on feeding field pea grain to beef cows; however, there are numerous field reports of cow-calf producers using field pea grain for wintering cows. Encinas et al. (2000) fed increasing levels of field pea grain or a barley-canola meal protein supplement to gestating cows consuming grass hay. No differences were observed in cow ADG, condition score, calving, or other performance traits.
Feeding Recommendations

The nutrient density of field pea grain is greater than most other feedstuffs, so including pea grain in limited-fed applications may be the best use of this feed. These uses include creep feeds, receiving diets, and supplementation of low-quality forage diets (e.g., range cake). Processing studies indicate field pea grain should be dry-rolled when fed in creep feeds. Creep feed diet formulations may include 20 to 50% field pea grain with 30% to 40% considered optimum (DM basis). Mixed results for processing have been reported in feedlot trials, but dry rolling field pea grain did not negatively affect performance and was positive in some trials. In addition, anecdotal observations indicate diet mixing is enhanced and sorting is reduced when field pea grain is processed and fed in a totally mixed ration. Field pea grain is used primarily as a protein source in feedlot diets. In corn-based rations, 18 to 25% inclusion (DM basis) will meet nutrient requirements although higher levels have been fed with equal or greater performance. The ruminal protein degradation characteristics of peas complement corn-based feedlot diets particularly well. No research has been conducted on feeding field pea grain in barley based diets.

Beef cows fed low-quality forage will benefit from a highly RDP such as field pea grain. Pea grain does not need to be processed for beef cows consuming forage-based diets. This grain legume works well as a binder in pelleted formulations and will increase nutrient density of commercial feedstuffs based on high fiber coproducts. Commercial range cake that contains field pea grain provides increased levels of protein, energy, vitamins, and minerals and may be fed at lower rates than other cake products based on feeds with lower nutrient densities. Heating, toasting, or extruding field pea grain may increase RUP but does not appear economically feasible or necessary for most beef cattle ration applications.

IMPLICATIONS

The major factor in determining whether to use field pea grain in cattle rations is the cost compared with other feedstuffs. The equivalent feed value should be calculated based on respective nutrient contents with potential savings in logistics as pea grain is more nutrient dense than other commodity feeds. In some cases, superior animal performance may result with field pea grain in the diet. Increased tenderness and juiciness of steaks from cattle fed field pea grain may lead to a marketing or branded beef program with associated premium prices. Field pea is an excellent rotation crop for small grains and can provide protein and energy for livestock that may ultimately enhance the biological and economic sustainability of farms and ranches.

LITERATURE CITED


