**Nutritional Value of Thistle**

**Introduction**

A previous forage fact (see FF #103) discussed how livestock can in fact be trained to graze invasive plants, such as Canada thistle. Under coaching from Kathy Voth with Livestock for Landscapes, cooperators in the Peace successfully trained a flock of sheep, a pair of goats and heifers, cow/calf pairs and mixed cattle herds to graze weeds.

Now that it is known livestock can be successfully trained to graze weeds, questions started to come in about the nutritional quality of the plants being incorporated into livestock diets.

**Feed Quality of Thistles**

It is often assumed that weeds have low nutritional values. During this project 11 samples of thistle were taken for nutritional analysis from 5 different cooperators. Samples were taken from mature thistle and thistle regrowth (either after grazing or clipping). The average protein value of Canada thistle throughout the growing season was 12.8%; but, protein quality varied from 8% (mature plants) all the way up to 27% (young regrowth) (see Table 1).

Further, Canada thistle has an average energy value (total digestible nutrients – TDN) of 65.5%! This high digestibility is due to the higher leaf to stem ratio of thistles in comparison to grasses.

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### Table 1: Average nutritional values of thistle sampled (11 samples)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein (CP)</td>
<td>12.8%</td>
<td>7.5% - 27.3%</td>
</tr>
<tr>
<td>Total Digestible Nutrients (TDN)</td>
<td>65.5%</td>
<td>63.0% - 69.7%</td>
</tr>
<tr>
<td>Neutral Detergent Fiber (NDF)</td>
<td>39.2%</td>
<td>34.4% - 45.2%</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>2.4%</td>
<td>1.5% - 4.12%</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>0.2%</td>
<td>0.2% - 0.3%</td>
</tr>
</tbody>
</table>

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**Forage Fact #104**

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www.peaceforage.bc.ca
Thistle vs Pasture

Canada thistle is a nutritious plant. From the analysis and research on nutritional quality of weeds, thistle is on par with grass-legume mixed pastures (Table 2). In fact, thistle generally has nutritional values comparable to alfalfa. These high protein weeds can help livestock achieve a balanced diet when other lower quality forages or pastures might not be enough to meet their nutritional needs (such as late season grazing). Finally, weeds tend to be resilient, determined plants! In the US, they have observed that weeds are often available as a forage source during drought conditions when other forages are less abundant.

Table 2: Nutritive value of thistle compared to various pastures

<table>
<thead>
<tr>
<th></th>
<th>Mature Thistle</th>
<th>Thistle Regrowth after grazing or clipping</th>
<th>Mixed pasture, early vegetation</th>
<th>Mixed pasture, late vegetation</th>
<th>Alfalfa pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein (CP)</td>
<td>8.6%</td>
<td>15.2%</td>
<td>18%</td>
<td>13%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Total Digestible Nutrients (TDN)</td>
<td>64.1%</td>
<td>66.3%</td>
<td>75%</td>
<td>62%</td>
<td>62%</td>
</tr>
</tbody>
</table>

1Sheepbytes

Cows teaching calves to eat thistle or vice versa at Chuck & Pat Sutherland’s place during training day 5 (left side).

Ewe teaching her lamb to eat Canada thistle at Tess Davidson’s place one year after ewe was trained (right side).

Table 3: Nutritive value of thistle in relation to the requirements of cattle and sheep

<table>
<thead>
<tr>
<th></th>
<th>Cow requirement1</th>
<th>Sheep requirement2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maintenance</td>
<td>Lactation</td>
</tr>
<tr>
<td>Crude Protein (CP)</td>
<td>7-8%</td>
<td>11%</td>
</tr>
<tr>
<td>Total Digestible Nutrients (TDN)</td>
<td>55%</td>
<td>65%</td>
</tr>
</tbody>
</table>

1Beef Ration Rules of Thumb – Alberta Agriculture, Food and Rural Development

2Sheep Nutrition Fact Sheet – Saskatchewan Sheep Development Board & Saskatchewan Ministry of Agriculture
How does this compare to the requirements of cows and sheep?

Weeds can often be incorporated into the diets of cattle and sheep to help them meet their nutritional needs in grazing situations. A mature beef cow requires a ration of around 7 to 8% crude protein, while sheep need around 9% crude protein in their diet for maintenance. Both species require around 55% TDN for maintenance. Canada thistle falls well within this range (Table 3). Further, thistle regrowth, or thistle in a vegetative state, is comparable to the nutritional requirements of both cattle and sheep during lactation.

Nutritional Value of Other Weeds

This project focused on Canada thistle. However, there are many other highly nutritious weeds in the Peace country and across BC (see Table 4 and photos below). Most weeds do not have a high enough content of toxins to cause any adverse health effects so long as livestock have access to a variety of plant species to graze and are never forced to graze a single species.

Table 4: Nutritional value and potential toxins of other weeds

<table>
<thead>
<tr>
<th>Weed</th>
<th>% Crude Protein</th>
<th>TDN</th>
<th>Potential Toxins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curley dock¹</td>
<td>17-28%</td>
<td>-----</td>
<td>Livestock poisoning rare; can accumulate oxalates</td>
</tr>
<tr>
<td>Diffuse knapweed²</td>
<td>7-18%</td>
<td>59-62%</td>
<td>No toxicity reported</td>
</tr>
<tr>
<td>Spotted knapweed²</td>
<td>8-20%</td>
<td>59-63%</td>
<td>No toxicity reported</td>
</tr>
<tr>
<td>Lamb’s quarter³</td>
<td>17%</td>
<td>70%</td>
<td>Can accumulate nitrates and oxalates</td>
</tr>
<tr>
<td>Perennial sowthistle¹</td>
<td>13-21%</td>
<td>66-82%</td>
<td>No toxicity reported</td>
</tr>
<tr>
<td>Canada thistle²</td>
<td>12-21%</td>
<td>58-61%</td>
<td>Can accumulate nitrates</td>
</tr>
</tbody>
</table>


² Peters, A., S. Filley and A. Hulting. 2011. Forage values of pasture weeds in southwestern Oregon. 64th Society of Range Management Meetings, Billings, MT


⁴ Nutrition Value and Toxins in Various Noxious Weeds. Utah State University
“If we say we are good stewards of the land, how can we ignore a tool that has the potential to help us control invasive weeds?”

Steve Rainey, Lone Prairie, BC

### Nutritional Value

**Nitrates**

Canada thistle can accumulate nitrates. Microorganisms in the rumen will reduce nitrates into nitrites then nitrites into ammonia and then ammonia into proteins. When ruminants consume high nitrate feed, some of the nitrate cannot be converted to nitrite then ammonia causing both nitrate and nitrite to accumulate. Poisoning can occur when nitrite levels in the rumen are higher than the microbes capacity to convert it to ammonia. Sheep have a higher tolerance to nitrates than cattle. Canada thistle (and agronomic species such as oats and barley) can accumulate nitrates in stressful situations, such as drought, frost, hail, or herbicide treatments.

The rumen can adjust to nitrates if you allow the animal to adapt slowly to nitrate in feed, increase how much it eats over time and ensure livestock are always offered a balanced ration.

**Oxalates**

Oxalates are potassium and sodium salts that some plants store rather than absorbing any excess nitrates. If large quantities of oxalates are eaten by a ruminant, it can overwhelm the rumen's ability to metabolism them. This causes them to be absorbed into the blood stream where they form in-soluble salts that precipitate in the kidney and can lead to kidney failure. As with nitrates, the rumen can adapt to oxalates if they are introduced slowly over time and by ensuring livestock are always offered a balanced ration.

### Conclusion

Weeds can be successfully incorporated into the diets of livestock with a simple training plan. However, even if we can train livestock to readily eat certain weeds, livestock should never be forced to consume a diet solely of one particular species. Keep in mind that tame forage species commonly used in pastures and on rangelands are bred to be high in nutrients and low in toxins thereby reducing the risk of any adverse effects of grazing animal eating a single species. When incorporating weeds into livestock diets, they should be offered a pasture with a variety of plants to keep safe. Allowing livestock to graze in a mixed pasture with a variety of plants will allow the animal to increase or decrease what it consumes based on the internal feedback it gets (see FF #103). Training livestock is easy and fun. Also trained livestock will take advantage of a varied diet of highly nutritious forages and help you to manage weeds on your landscapes so you don’t have to.

Compiled by: Lori Vickers, Kari Bondaroff & Sandra Burton, January 2017

Photo Credits: Ann Grover, Vicki Moser, Lori Vickers, Denise Booey & Tess Davidson

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