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AN280

Utilization of Cull Vegetables as Feedstuffs for Cattle[1]

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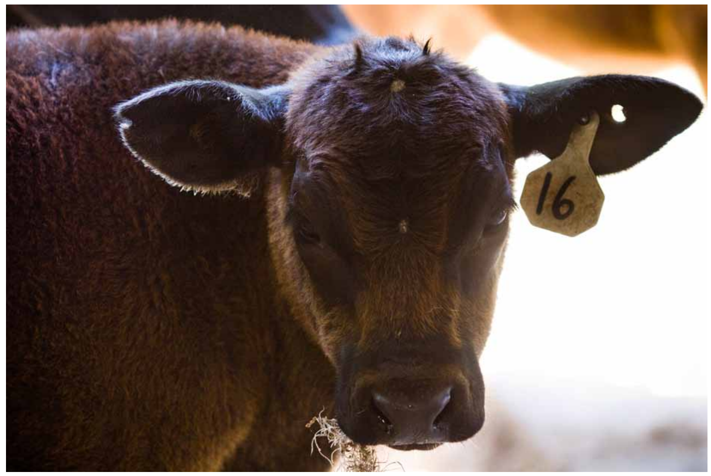
Use of cull vegetables as a feed resource for beef cattle can be an economical source of nutrients in beef cattle diets. Often these cull vegetables are offered to beef cattle producers at a decreased cost or no cost. The use of cull vegetables as feed resources can be a valuable resource for beef cattle producers, but not without some consideration for their use. This paper discusses the nutrient content and characteristics that need to be understood when utilizing cull vegetables.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Product Characteristics

Many of the cull vegetables available for use by beef cattle producers are low in dry matter (Table 1). The amount of moisture that these products contain results in some considerations for their use as cattle feed. The water in cull vegetables dilutes the nutrients when utilized as a feed resource for beef cattle. As a result, cattle have to consume large quantities of a particular cull vegetable to receive any appreciable level of nutrient intake. However, the low dry matter content can physically limit the intake of cull vegetables to an amount that does not provide an adequate nutrient supply. Likewise, cattle consuming large amounts of cull vegetables and the associated water can have limited intake of other desirable feedstuffs, which are more nutrient dense. This is particularly important relative to grazed or conserved forages, which are the primary source of nutrition for beef cattle in cow-calf enterprises.

Cull vegetables should be compared to other feedstuff on a water-removed, dry-matter basis. The energy value assessed by total digestible nutrients (TDN) and crude protein (CP) of cull vegetables (Table 1) can be quite favorable compared to other feed resources. The majority of the available energy in cull vegetables is derived from digestible fiber, simple sugars, and other digestible carbohydrates. Potatoes are the exception because they contain high concentrations of starch (58%–77%) that is rapidly fermented to provide energy. The fat content of cull vegetables is generally low, so fat is not a major source of energy in vegetables. Calcium and phosphorus contents of cull vegetables vary. In some cull vegetables calcium and phosphorus are correctly balanced for ruminants in the 2:1 ratio (cabbage, lettuce), whereas other vegetables have an inverted calcium:phosphorus ratio (beans, peas, potato, pumpkin, tomato). Other trace minerals of secondary importance are present in cull vegetables and should be assessed if

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long-term high feeding levels of cull vegetables are utilized in cattle diets. Because of the large amount of water consumed with cull vegetables that stimulates salt-mineral consumption, the supplemental mineral intake may need to be modified. Thus, the final supplemental mineral formulation may need to be addressed to limit over-consumption of mineral supplement. Ultimately, cattle consuming cull vegetables need appropriately balanced mineral supplements to address mineral deficiencies or imbalances and their total mineral requirements.

Cull vegetables, like any other feedstuff, will have variability associated with the nutritive and chemical analysis. The variability of cull vegetables may be even greater than other traditional feedstuffs based upon growing conditions, plant variety, and actual vegetable size. The observed variability in cull vegetable nutrient analysis can be as great as 50% or more. The variability of cull vegetables is a primary hindrance to their use.

Storage and Use

Storage life of cull vegetables is very dependent on the dry-matter content of the material. Therefore, spoilage of fresh cull vegetables is a concern. Material with low dry matter content has a limited shelf life that generally does not exceed a few days, particularly in warm-humid conditions. Cull vegetables may arrive on the ranch already in the spoilage process, which can increase the danger of mycotoxins, molds, and total product loss. Likewise, the opportunity for spoilage of the cull vegetable material is great, particularly when stored in large outdoor piles. Cull vegetable material can be ensiled with some measure of success, which can extend the storage life of the product. However, the low dry-matter content of many cull vegetables does present challenges to successful ensiling. Often, combining cull vegetable with dry hay can increase the total dry-matter content and potentially improve the ensiling process. The mixing of cull vegetables with dry hay or roughage should result in a product with a composition of 45%–55% dry matter. This mixture can be obtained by following the guidelines in Table 2. Additionally, blending different cull vegetables into one product can increase the success of using cull vegetables. Different cull vegetables can provide a different mix of nutrient supply and dry-matter content.

Cull vegetables and fresh forage share a number of characteristics. The dry-matter content and particle size of cull vegetables are similar in some cases to the forage selected by cattle grazing lush pasture. However, the nutritive value will be quite different from typical grazed pasture forage. Intake of cull vegetables is expected to be variable and dependent upon the specific vegetables. Generally, byproduct feedstuffs including cull vegetables should be limited daily to no more than 0.5% (on a dry-matter basis) of bodyweight of the animal. For example, a 1,000 lb cow should be limited to 5 lbs of dry matter from cabbage (1,000 lbs x 0.5%); cabbage has a dry-matter value of 9.5%, and thus 52.6 lbs (5 lbs dry matter ÷ 9.5%) of fresh cabbage could be offered to an individual cow on a daily basis.

Conclusion

The water content, variability of the product, and potential for spoilage are the primary drawbacks to full utilization of cull vegetables. Producers considering using cull vegetables should obtain specific chemical analysis to ascertain true chemical composition. Cull vegetables can be an economical feedstuff resource compared to other feed resources. However, the amount of intake for most of the cull vegetables to achieve any appreciable nutrient intake is quite high, and can potentially displace other feedstuff intake. Storage and handling costs could offset the savings derived from cull vegetables in some situations. Therefore, beef cattle ranchers should carefully consider the option to use cull vegetables as a feed resource.

Citations

United States National Research Council (US NRC), Committee on Animal Nutrition, and Canada Department of Agriculture Research Branch, Committee on Feed Composition. Atlas of Nutritional Data on United States and Canadian Feeds. Prepared by the US NRC Subcommittee on Feed Composition: E. W. Crampton, chairman, and L. E. Harris. Washington, DC: National Academy of Sciences, 1971.

Dairy One, Forage Laboratory Services, Feed Composition Library (accessed May 25, 2012). http://www.dairyone.com/Forage/FeedComp/MainLibrary.asp

Table 1. Nutritive value and chemical composition of selected cull vegetables[1]

Item	Dry matter	% of Dry matter					
		TDN[2]	Crude protein	Crude fiber	Fat	Calcium	Phosphorus
Bean, navy	90	84	24	5.0	1.4	0.17	0.65
Black-eyed peas	92	92	27	7.3	1.7	0.12	0.50
Cabbage	9	85	24	15.8	4.2	0.64	0.35
Carrot, root	12	83	10	9.1	1.4	0.40	0.34
Carrot, top	16	73	13	18.1	3.8	1.90	0.19
Cantaloupe	10	66	7	6.9	1.4	0.21	0.21
Cauliflower	9	70	30	11.1	2.2	0.22	0.67
Citrus Pulp	20	70	8	17.0	3.4	1.50	0.16
Celery	6	70	30	10.2	1.7	0.66	0.47
Cucumber	5	56	15	8.7	2.2	0.35	0.52
Eggplant	8	57	12	14.6	3.7	0.28	0.38
Green bean	89	63	17	25.3	3.8	--	--
Lettuce	5	51	22	11.2	4.1	0.86	0.46
Peas	89	97	25	6.0	1.5	0.20	0.43
Potato	21	80	10	2.4	0.4	0.04	0.24
Pumpkin	9	85	16	14.2	8.9	0.24	0.43
Spinach	7	51	31	9.6	4.1	1.10	0.75
Squash	5	54	26	10.8	5.0	0.23	0.39
Tomato	6	69	16	9.1	5.0	0.16	0.49
Turnip, top	13	67	13	10.3	2.6	2.92	0.51
Turnip, fresh	9	85	34	11.5	1.9	0.59	0.26
Watermelon	7	67	7	2.7	1.4	0.08	0.10

[1] Adapted from Dairy One Feed Library, accessed May 25, 2012; Atlas of Nutritional Data on United States and Canadian Feeds; various feed composition tables.
[2] Total digestible nutrients

Table 2. Mixing guidelines to ensile cull vegetables with dry hay

Final desired dry matter, %	Cull vegetable dry matter %		
	5%	10%	15%
	% hay in mix		
45	46.0	42.7	39.0
46	47.1	43.9	40.3
47	48.3	45.1	41.6
48	49.4	46.3	42.9
49	50.6	47.6	44.2
50	51.7	48.8	45.5
51	52.9	50.0	46.8
52	54.0	51.2	48.1
53	55.2	52.4	49.4
54	56.3	53.7	50.6
55	57.5	54.9	51.9