

Evaluation of Forage Nutritive Value of Quinoa Cultivars

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Introduction

Quinoa is a specialty crop that originated from the Andean region. Its seeds provide health benefits for humans, and in recent years quinoa has been used as an animal feed because of its high nutritional value.

There are various parameters to judge the quality of a forage crop, including crude protein (CP), relative feed value (RFV), total digestible nutrients (TDN), and in vitro dry matter digestibility (IVDMD).

In contrast, anti-quality factors like acid detergent fiber (ADF) and neutral detergent fiber (NDF) should be at a minimum level. ADF refers to the cell wall portions of forage that are made up of cellulose and lignin. NDF refers to the cell wall portion including ADF plus hemicellulose. As ADF and NDF content increases, digestibility of the forage decreases. Further, forage quality of a crop also depends on various factors like plant species, growth stage, and management practices.

Quinoa has been evaluated worldwide for its potential as a forage crop, but in Wyoming limited information is available on its cultivation and nutritive values.

Objectives

The objective of this study was to determine the forage nutritive value of different quinoa cultivars.

Materials and Methods

The study was carried out at the Laramie Research and Extension Center (LREC) in 2015 and 2016 under irrigated conditions. Six cultivars of quinoa (Cherry Vanilla, Mint Vanilla, Red Head, Oro de Valle, Brightest Brilliant Rainbow, and French Vanilla) were planted in a randomized complete block design with three replicates. In 2015, planting was on May 18, while harvesting took place August 21. In 2016, planting and harvesting were May 5 and August 31, respectively. Forage quality

parameters (CP, NDF, ADF, IVDMD, TDN, and RFV) were determined. Samples were ground in a Wiley[®] mill, nutritive values were analyzed using near infrared reflectance spectroscopy, and data were analyzed using the statistical software SAS 9.4.

Results and Discussion

In 2015 and 2016, there were no significant differences in any of the forage quality parameters among quinoa cultivars (Table 1). However, forage quality differed over the two years. Quality parameters like CP, IVDMD, TDN, and RFV were higher, while anti-quality parameters like ADF and NDF were lower in 2015 as compared to 2016. Thus, quinoa grown in 2015 had higher nutritive values than in 2016. The difference in forage quality between these two years was likely due to the age of crop. Nutritive value of a crop usually declines with the advancement of plant age. In 2015, quinoa was harvested at 96 days after planting while in 2016, it was 119 days.

Furthermore, the nutritive values of quinoa were in the range of a crop used for forage. Quinoa seems to be comparable to corn silage (7–10% CP, 41–54% NDF, 24–33% ADF, and 67–71% TDN). Also, forage quality of quinoa can be compared to that of alfalfa if harvested at the earlier stage.

So, regardless of the cultivars tested, quinoa has the potential for use as an alternate forage crop for all farm animals in Wyoming.

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Table 1. Forage nutritive values of different quinoa cultivars at LREC in 2015 and 2016.

Cultivars	CP (%)		NDF (%)		ADF (%)		IVDMD (%)		TDN (%)		RFV	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Cherry Vanilla	26	13	29	34	21	30	85	70	79	68	234	181
Mint Vanilla	23	14	31	35	22	30	81	71	79	70	219	178
Red Head	25	14	30	37	21	31	83	67	78	68	226	163
Oro de Valle	23	14	30	34	21	30	82	70	78	70	223	179
Brightest	22	13	33	39	24	35	78	62	76	64	202	147
Brilliant												
Rainbow												
French Vanilla	22	13	32	38	23	32	80	66	77	67	210	160
Average	24	13	31	36	22	31	81	68	79	68	219	168

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