Evaluation of Quinoa and Fenugreek in Wyoming Conditions

S. Baskota¹ and M.A. Islam¹

Introduction
Fenugreek and quinoa are both annual, specialty crops having potential for multi-purpose use. For starters, they are highly nutritious. High fiber and protein content and presence of bioactive compounds help make fenugreek a nutritious crop (Meghwal and Goswami, 2012). Fenugreek also has been used as a medicinal plant to help treat hyperglycemia, hyperlipidemia, and disorders of the gastrointestinal and cardiovascular systems (Sangeetha, 2010). Quinoa, meanwhile, is a specialty crop containing vitamins, minerals, protein, fiber, and essential amino acids. In addition to its nutrition values for humans, quinoa is gluten free, meaning it can be consumed by people with celiac disease, and it can also be used for animal feed and green fodder (Jacobsen, 2003). As a legume crop, fenugreek fixes atmospheric nitrogen and enriches soil by supplying nitrogen to the soil pool. Both crops can sustain in a wide range of climatic and soil conditions. Because of this, they are cultivated in different parts of the world, and both have high commercial value.

Fenugreek and quinoa have further potential as a possible forage crop. In places like Wyoming, where the growing season is short across much of the state and feed is usually scarce during winter and early spring, these annual crops may be useful in supplementing animal feed. Although many studies have been conducted in Europe, Canada, and other parts of the world, limited information is available whether these crops can be grown for their full growth potential in states having less-than-ideal growing conditions, such as Wyoming.

Objectives
The objectives of this study are to evaluate different genotypes/cultivars of fenugreek and quinoa for growth and yield potential.

Materials and Methods
The study was conducted at the Laramie Research and Extension Center (LREC) and James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) near Lingle in 2015. One cultivar and four genotypes of fenugreek (‘Tristar’, ‘F96’, ‘LRC3375’, ‘LRC3708’, and ‘F75’) and six cultivars of quinoa (‘Cherry Vanilla’, ‘Mint Vanilla’, ‘Red Head’, ‘Oro de Valle’, ‘Brightest Brilliant Rainbow’, and ‘French Vanilla’) were tested at both locations. Fenugreek seeds were inoculated with Rhizobium bacteria to enhance the nodulation for fixing nitrogen prior to seeding. Seed sowing took place May 18 at LREC and June 3 at SAREC. There were three replications for each treatment, and each plot size was 100 square feet. Planting was done in rows 9 inches apart. The experiments were conducted under irrigated conditions to provide “optimum” growing conditions. Irrigation amount for each plot at one location was the same. The soil at both locations was slightly alkaline (pH 8.1). Nitrogen was applied in quinoa at 134 pounds per acre, but not to fenugreek as this plant can fix atmospheric nitrogen on its own. Biomass data were collected on August 19 at LREC and August 21 at SAREC. Seed yields were also recorded for all genotypes/cultivars.

Results and Discussion
Among the quinoa cultivars planted at SAREC, Red Head produced the highest dry matter (DM) yield (1,990 lbs/ac) while Brightest Brilliant Rainbow produced the highest seed yield (351 lbs/ac) (Figures 1 and 3). At LREC, Mint Vanilla produced the highest DM (520 lbs/ac) while Brightest Brilliant Rainbow produced the highest seed yield at 284 lbs/ac. Among fenugreek genotypes/cultivars, F96 produced the highest DM and seed yields at both LREC (1,499 and 288 lbs/ac, respectively) and SAREC (3,522 and 1,602, respectively) (Figures 2 and 4).

The variation in DM and seed yields at Laramie and Lingle was primarily due to (1) the elevation difference between the two locations (SAREC is 4,173 feet above sea level while LREC is 7,200 feet); and (2) climatic variations as Laramie received high natural precipitation in July (2.81 inches) and October (2.67 inches). The unexpected high precipitation at the time of plant establishment at LREC in July created very wet soils.

¹Department of Plant Sciences.
which ultimately led to some lodging effect. Concerning the latter, many plants from some cultivars/genotypes for both fenugreek and quinoa fell to the ground, reducing the number of plants per plot. Additional heavy precipitation in October at LREC caused seeds to shatter, which affected seed yield. However, quinoa cultivar Red Head and fenugreek genotype F96 performed well at both locations, indicating their growth potential in Wyoming conditions. It is clear that there is genotypic variance in these two cultivar/genotypes, which makes them perform better even in wet conditions. The study is being repeated in 2016, and additional agronomic data including planting time and fertilization effects and forage quality will be measured.

Acknowledgments
We thank Dhruba Dhakal, Dennis Ashilenje, Sayantan Sarkar, and LREC and SAREC staff for assistance in experimental set-up and data collection. The study is supported by grant funds from the Wyoming Department of Agriculture’s Agriculture Producer Research Grant Program and the Specialty Crop Grant Program and Hatch funds from the U.S. Department of Agriculture.

Contact Information
Saugat Baskota at sbaskota@uwyo.edu, or Anowar Islam at mislam@uwyo.edu or 307-766-4151.

Keywords: fenugreek, quinoa, forage potential

PARP: I:2, II:2, VI:1,8

Literature Cited


Figure 1. Dry matter (DM) yield of different cultivars of quinoa at Laramie and Lingle. Line associated with the bars is standard error.

Figure 2. Dry matter (DM) yield of different genotypes/cultivars of fenugreek at Laramie and Lingle. Line associated with the bars is standard error.

Figure 3. Seed yield of different cultivars of quinoa at Laramie and Lingle. Line associated with the bars is standard error.

Figure 4. Seed yield of different genotypes of fenugreek at Laramie and Lingle. Line associated with the bars is standard error.