Teff (*Eragrostis tef*) Yield and Quality as Influenced by Irrigation and Nitrogen

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Introduction

Teff is a warm season annual grass. Typical maturity for grain varies from 93 to 130 days. Grain color ranges from pale white to ivory white, very light tan to deep brown to reddish-brown purple. Teff seed is very small with l000-seed weight averaging 0.3–0.4 g, similar to timothy. Teff is adapted to environments ranging from drought-stressed to water-logged soil conditions. In its native habitat, maximum production occurs at elevations of 1,800 – 2,100 m, growing season rainfall of 430–560 mm, with a temperature range of 10–30°C. Teff is day length sensitive and flowers best at 12 hours of daylight. Tests at higher latitudes showed reduced flowering and seed formation for both short day (8 hours of light) and long day (16 hours of light) conditions. However, genetic diversity is wide for this species and grain production using selected landraces has been successful in some cases at temperate latitudes.

Several improved varieties have been selected for grain production and released in Ethiopia, South Africa, and the United States.

Objective

The potential for teff as a forage crop appears promising; however, many questions remain unanswered. Teff water use efficiency is unknown and nitrogen (N) fertilizer use efficiency for forage production is unknown, yet knowledge of these factors is indispensable for positive economic outcomes for growers.

Methods and Materials

Teff experiments were planted as a randomized complete block design in Klamath Falls, Medford and Ontario, Oregon. The plots were irrigated with a line source sprinkler and nitrogen treatments of 0, 90 and 179 kg ha^{-1}. The N rate x irrigation rate studies were analyzed as a split-block design, with irrigation rate as the main plot and N rate as subplot. Plots were analyzed in a near infrared spectrophotometer (NIRS) (NIRSystems) to determine forage quality. Calculated forage quality parameters included crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), relative feed value (RFV) and relative forage quality (RFQ).

Figure 1. Influence of Nitrogen Rate on Teff Yield 1st Harvest

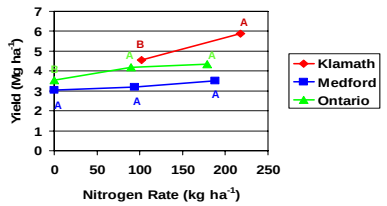


Figure 2. Influence of Irrigation and Precip. on Yield of Teff (1st Harvest)

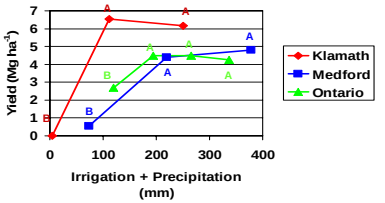


Figure 3. Influence of Nitrogen Rate on Teff Protein 1st Harvest

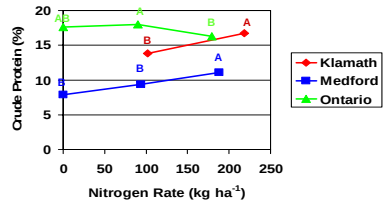


Fig. 4. Influence of Irrig. and Precip. on Crude Protein of Teff (1st Harvest)

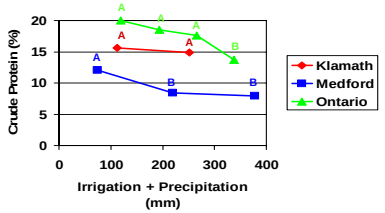


Figure 5. Influence of Nitrogen Rate on Teff Relative Feed Quality (1st Harvest)

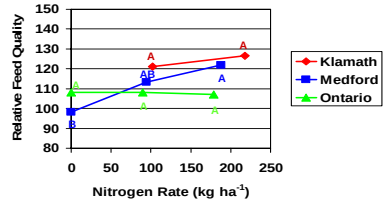
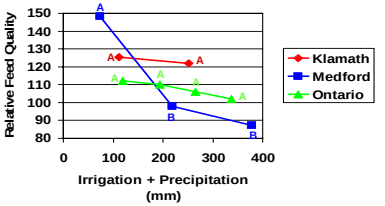


Fig. 6. Influence of Irrig. and Precip. on Teff Relative Feed Quality (1st Harvest)



Results

Teff grew well and produced good yields and quality at all three locations that represent different climate types in Oregon and in general there were consistent responses. The lowest rate of irrigation and lack of added fertilizer N clearly reduced yields. However, the highest rate of irrigation and N fertilizer often did not improve yield or quality compared to a moderate rate of both N and irrigation. Thus, under the range of conditions examined here, it appeared that teff responded to some added N, but that N fertilization greater than about 90 kg ha^{-1} during the growing season was probably not justified. Teff also responded to a moderate level of irrigation. In general, as the irrigation rate increased quality (as measured by crude protein, ADF, NDF, TDN, RFV and RFQ) decreased.

Conclusion

Teff generally responded to modest amounts of irrigation and nitrogen fertilizer and produced hay up to 11.2 Mg ha^{-1} with a relative feed quality around 100-120, which is equivalent or better than the quality of full bloom alfalfa hay.

Acknowledgement

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