

# Teff

## A New Warm-season Annual Grass for Oregon

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Teff is a warm-season annual grass that is increasing rapidly in popularity among hay growers in the United States. Teff (*Eragrostis tef* [Zucc.], Poaceae) is classified as intermediate between tropical and temperate grasses. It has many small-stemmed tillers originating from one crown and a shallow, diverse root system. Teff has no tolerance to freezing temperatures at any stage of its life cycle.

Teff is traditionally harvested for grain in Ethiopia, where its flour is used for the production of *injera*, a major food staple. The nutritional value of teff grain is similar to that of traditional cereals. Teff is considered to have an excellent amino acid composition.<sup>1</sup> Its lysine levels are higher than those of wheat or barley but slightly lower than those of rice or oats. Teff is also higher in iron and calcium than wheat, barley, and sorghum.<sup>1</sup> It is considered gluten free by the University of Chicago Celiac Disease Center.<sup>2</sup>

Teff is grown on a limited basis for livestock forage in Africa, India, Australia, and South America. Teff straw is often fed to livestock after grain is harvested in Africa. Teff hay is high in quality, and South African farmers prefer it to other hay for feeding dairy cattle, sheep, and horses.<sup>1</sup>

In Oregon, teff's short production cycle makes it useful in several situations.

- If water is scarce, production can be matched with the time when irrigation water is available.
- Teff will work as an emergency or rescue crop after a crop failure as long as previous herbicide applications do not prohibit stand establishment.
- Teff is an excellent interim crop between crops of alfalfa.
- In the Treasure Valley and the Columbia Basin, growing teff as a double crop may be an option. In these areas, a second planting in July will produce one harvest of hay or can serve as a green manure crop.

Crop rotation is relatively easy following teff, as only small crowns and fine roots remain after hay is removed.



*Teff variety trials at the Malheur Experiment Station, near Ontario, Oregon.*



*Teff being swathed at the Klamath Basin Research and Extension Center, near Klamath Falls, Oregon.*

### Hay quality and use

According to reports from producers and horse owners, teff makes excellent horse feed. Teff hay can also be used for beef cattle. In Oregon and Washington variety trials, teff hay had a Relative Feed Quality (RFQ) ranging from 78 to 108 (Table 1, next page). On average, quality equaled that of full-bloom alfalfa. In other Oregon research, with varying irrigation and nitrogen rates, teff's RFQ ranged from 86 to 169. Thus, teff is not a replacement for dairy-quality hay, which typically has an RFQ of 180 or above.

### Yield

Teff planted about June 1 at Klamath and Malheur Experiment Stations in Oregon typically yields a total of 4 to 6 tons/acre from harvests in mid- to late July and early to mid-September (Table 2, next page).

### Varieties

In 2006, Oregon research found no consistent difference in yield or hay quality among varieties and lines. Varieties tested included 'Dessie' and 'Pharoah' from First Line Seeds, 'VA-T1-Brown' from Hankins Seed, 'Tiffany' from Target Seeds, and 'X9' and 'XP10' from United Seed.

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<sup>1</sup> National Academy Press. 1996. *Lost Crops of Africa, Grains*, Vol. 1:214-235.

<sup>2</sup> University of Chicago Celiac Disease Center. 2008. <http://www.celiacdisease.net/gluten-free-diet>

## Growing conditions

Teff performs best in well-drained soils where irrigation and/or natural rainfall meet crop evapotranspiration requirements. However, it is well adapted to a variety of soil conditions, ranging from drought-stressed to water-logged soils. It will also grow in poor soils.

## Planting

Because teff is a warm-season grass, it does not grow rapidly in cool weather or tolerate freezing; thus, delay planting until the likelihood of frost is low. In Oregon, teff typically is planted in early June for a full season of growth, but it may be planted as late as the end of July for an emergency crop or double crop.

Like alfalfa, teff germinates much better in a fine, firm seedbed. Plant teff at 6 pounds per acre, using a cultipacker or “Brillion” drill that can handle very small seeds (about 1 million per pound). Slightly higher seeding rates are needed to achieve an adequate plant population if seedbed and irrigation conditions are less than optimal.

Seed can be surface broadcast if sprinkler irrigation is available; otherwise, incorporate very shallowly with a harrow. Plant about 1/8 to 1/4 inch deep.

Light, frequent irrigations are needed for optimum stand establishment, especially with high air temperatures and dry soil. Emergence is rapid (3 to 7 days) when mean 4-inch soil temperatures are 60°F or higher and soil water is adequate.

## Fertilizing

Base fertilization on a soil test. Typically, 80 to 100 pounds of nitrogen per acre per year is adequate for optimum yield and quality. Apply half the nitrogen fertilizer before or at planting and the rest after the first cutting. Excessive nitrogen will increase lodging and production costs. Apply phosphorus, potassium, and sulfur at rates similar to those for other pasture grass species, as indicated by soil tests. Phosphorus, potassium, and sulfur normally are applied and incorporated before planting.

**Table 1. Feed quality for a three-location variety trial (Ontario and Klamath Falls, Oregon, and Othello, Washington), 2006.**

	Crude Protein (%)	Acid Detergent Fiber	Neutral Detergent Fiber	Relative Feed Value	Relative Feed Quality
<b>First cutting</b>					
Minimum	11.0	36.2	58.0	82	89
Maximum	15.0	42.8	62.8	97	108
Average	13.1	39.8	60.1	90	98
<b>Second cutting</b>					
Minimum	8.1	37.0	58.5	80	78
Maximum	13.0	42.0	66.0	96	104
Average	11.1	39.9	62.0	87	91

**Table 2. Teff hay yields (Ontario and Klamath Falls, Oregon, and Othello, Washington), 2006.**

	Klamath Falls, OR (tons/acre)	Ontario, OR (tons/acre)	Othello, WA (tons/acre)
First harvest (July)	2.5	2.9	2.3
Second harvest (Sept)	3.4	2.1	3.8
<b>Total produced</b>	<b>5.9</b>	<b>5.1</b>	<b>6.1</b>

## Irrigation

Irrigate often after planting, especially if planting into a dry seedbed. Teff is relatively drought resistant once roots develop (2 to 3 weeks); however, maximum yields require adequate soil moisture. Once roots are established, irrigate according to 100-percent estimated crop water use for pasture (see Agrimet, <http://www.usbr.gov/pn/agrimet/>) or 70 percent of the reference evapotranspiration (ET<sub>r</sub>). Typical water use for teff production may range from 4 to 10 inches per cutting, depending on location.

## Weeds

Weeds have been the most significant pest observed in Oregon. Currently there are no labeled broadleaf herbicides for use on teff. Avoid fields with heavy barnyardgrass infestations, as this weed species will outcompete newly emerged teff seedlings.

## Harvest

Teff usually grows about 2 to 3 feet high. Harvest as soon as seed heads start to emerge. Closely examine fields to assess heading, as seed heads are not easy to see. Avoid conditions conducive to lodging, which makes swathing difficult. Lodging occurs more readily as plant height exceeds 3 feet and percent heading exceeds 5 percent. Wind or sprinkler irrigation near harvest can increase lodging.

When cutting hay, leave 3 inches of stem, as harvesting too short likely will reduce regrowth and plant vigor. Grazing generally is not recommended for the first cutting, as livestock can easily pull out the shallow roots. Grazing usually is not needed with the last harvest, since the crop will die with the first killing frost.

## Use pesticides safely!

- Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.
- Read the pesticide label—even if you’ve used the pesticide before. Follow closely the instructions on the label (and any other directions you have).
- Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.