

Using Teff as a Summer Cover Crop

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Cover crops can be used for many purposes, including preventing soil erosion and nutrient leaching, suppressing weeds, fixing nitrogen, and building soil organic matter. In New England most cover crops are seeded in the fall and terminated in the spring; summer cover crops are a practice associated with more southern areas. However, summer cover crops can be an important tool in northern areas also, particularly as vegetable growers use season extension techniques to increase production of spring and fall crops. All cover crops provide multiple services. For winter cover crops the primary service is prevention of soil erosion and nutrient leaching from late fall through early spring. In contrast, weed suppression is the primary service provided by summer cover crops. Many summer cover crops also fix substantial amounts of carbon, reducing carbon dioxide levels and building soil organic matter.

What is Teff?

Teff (*Eragrostis tef*) is a summer annual grass native to the Ethiopian Highlands of East Africa. Teff is grown both for forage and as a cereal grain in Africa. It was introduced into the US for use as a gluten-free grain but has become popular for use as a forage. It resembles other forage grasses in appearance (Figure 1), and tolerates traffic and mowing.

However, teff is like corn, sorghum, and sudangrass in being a warm-season grass, able to photosynthesize efficiently under warm, dry conditions. C4 photosynthesis allows teff to take full advantage of the high light intensity of summer. Teff has a lower optimal temperature for growth than sorghum or sudangrass, making it a good choice for regions such as coastal New England where summer temperatures rarely exceed 90°F. The extremely dense canopy effectively out-competes weeds, but teff is easily mowed and soil-incorporated with walk-behind equipment. Teff can also be cut and dried as hay, unlike sorghum or sudangrass. The hay is of premium quality, suitable for horses.



Figure 2. Teff eight weeks after sowing.

Growing Teff

Teff seed is extremely small, averaging 1.3 million seeds per pound. Most seed suppliers coat teff seed with clay or other inert materials to increase seed size and facilitate planting. In seeding rate tests at URI there were no differences in biomass yield, canopy height, or weed suppression when teff was seeded at rates ranging from 7 lbs/ac to 18 lbs/ac of coated seed. Reduce seeding rates by 50% if using raw seed. As of 2017, teff seed cost



Figure 1. Seeding with a Brillion cultipacker-seeder.



Figure 3. Teff seeded June 19th; photographed July 8th.

approximately \$3.30/lb if purchased in 50 lb. bags, and \$5/lb or more if purchased in smaller quantities. The per-acre cost is less than for buckwheat due to the much lower seeding rate for teff. Teff seed can be stored for at least two years without loss of viability if it is kept cool and dry.

Seed should be planted no more than ¼ inch deep into a very firm seedbed that is free of clods and debris. A fluffy or uneven seedbed will result in poor establishment as many of the seeds will be buried too deeply to successfully emerge. The preferred seeding implement is a Brillion grass seeder and cultipacker combination (Figure 2), which can create the seedbed and place

the seed in one operation. If seed will be broadcast or drilled, the field should be rolled or cultipacked before seeding. Shallow raking, rolling, or sprinkler irrigation can be used to ensure good seed-soil contact after broadcast seeding; do not use tillage to incorporate seed. Teff is not suited to no-till planting or frost-seeding.

Delay planting teff until the soil warms to 65°F at a depth of 4 in. Teff will germinate in cooler soil, but seedling growth is too slow for effective weed suppression. Teff can be seeded until the end of July in southern New England. Later seedings produce little biomass as daylengths under 13 hours trigger flowering. Forage teff remains green even once seeds mature.

Like all grasses, teff benefits from nitrogen, but only 30 to 50 pounds of available nitrogen per acre are needed to maximize biomass potential unless the teff is grown for hay with multiple cuttings. Good soil moisture is essential during establishment, but once teff is established it is very tolerant of drought. Teff is generally free from disease and insect problems, and will tolerate humidity and waterlogged soil.

Using Teff as a Cover Crop

Teff is generally grown as a monoculture. Extremely small seed size and shallow seeding depth make it challenging to mix teff seed with seed of other cover crops for single-pass planting. Most research on growing teff for biomass (rather than grain) has focused on forage use of teff, and there are no reports of studies using teff as a companion crop with legumes or other cover crops.

Teff will establish a weed-suppressing canopy in as little as 3 weeks (Figure 3). A seeding rate of 7.5 lb/acre results in over 250 teff seedlings per square foot, so teff can effectively out-compete weeds even with high soil seedbank levels for summer annuals such as crabgrass, pigweed, or smartweed. If the goal is to maximize biomass production, teff should be permitted to grow for at least 10 weeks before the

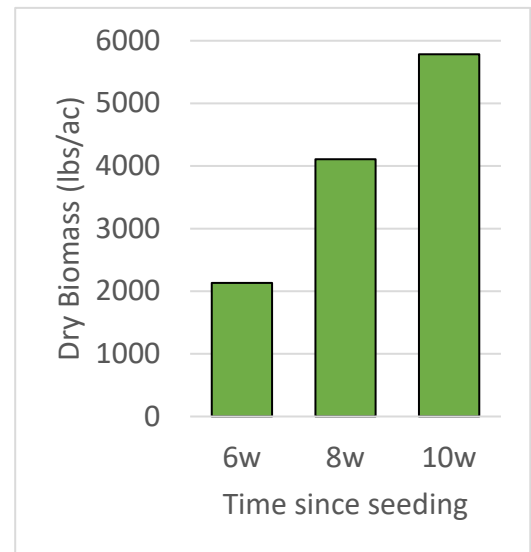


Figure 4. Effect of growth period on yield of teff biomass. Teff was seeded June 19 in Kingston, RI.

cover crop is terminated. In a trial at URI, teff seeded on June 19 produced just over 1 ton of dry biomass at 6 weeks after seeding, just over 2 tons at 8 weeks, and nearly 3 tons per acre at 10 weeks (Figure 4). Mowing can be used to prevent seed set in annual broadleaf weeds that germinate along with the teff. Teff tolerates many post-emergent broadleaf herbicides, including halosulfuron used to control nutsedge.

If the field is to be used for a fall crop, the teff can be terminated by tillage. Teff residue is more easily incorporated than cereal rye or sorghum, and no allelopathic effects have been reported for teff. Herbicides are not needed to prevent regrowth of teff after incorporation. Another option is to harvest the teff biomass as hay, or reduce it to mulch with a flail mower, and then transplant fall vegetables into the teff stubble. Regrowth is minimal on teff mowed in September or later (Figure 5). Teff is not suited to termination by rolling and crimping, as the stems are flexible and will not be crushed by the roller.

If the field is not used for a fall vegetable crop, the teff can be allowed to winter kill. Teff will mature seed if the first killing frost occurs later than mid-October, but in three years of experiments with teff at URI we have not found any indication that teff seed survives the winter to become weedy. Teff residue will prevent erosion, suppress growth of chickweed and other winter annuals, and be easily incorporated in spring.

Teff is highly tolerant of mowing down to 4-inch stubble, and it also tolerates traffic. Thus teff is an excellent choice for seeding into alleys, between raised beds, or between rows of pumpkins. Experiments at URI showed that when long-vine



Figure 3. Fall lettuce transplanted into a teff covercrop. Teff was flail-mowed in mid-September. In the planting on the left, teff was incorporated by roto-tilling. A zone-tiller was used to cut narrow planting rows for the planting on the right. Lettuce was transplanted Sept. 13th; photo date was Oct. 20th.



Figure 4. Teff seeded between rows of pumpkins at planting in June. Photos were taken July 23 (left) and September 26 (right).

pumpkins are planted with 10 feet between rows, 5-foot swaths of teff seeded between rows have no effect on pumpkin yields. The teff suppressed weeds, reducing pre-emergent herbicide use by 50%, and provided biomass to build soil organic matter (Figure 6).

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Additional Teff Resources

Teffgrass.com – a website developed by the leading US teff breeding program, CalWest Seeds, in partnership with USDA. Primarily addresses use of teff as a forage crop.

Covercrops.cals.cornell.edu – a website on covercrops for use in vegetable production; includes information on teff.