



Managing Cereal Grains for Forage

Dr. Heather Darby, UVM Extension

Cereal grains are a versatile crop that can be harvested for forage or grain. Cereal grains can be an excellent source of forage for dairy cows. You can expect quality forage similar to that of other cool season grasses. In our region, we most commonly utilize cereal grains as a nurse crop for a new seeding of perennial forages. However, higher yields can be obtained if the small grain is seeded alone. There is a variety of spring and fall seeded cereal grains that can be grown in our region. Spring grains are planted early, before last frost - many grains will germinate and grow when soil temperatures are below 40F. Winter grains are planted in late summer or early fall, and establish themselves before going dormant when the ground freezes. If the plants aren't killed by freeze/thaw drying or frost heaving over the winter, they take off in early spring and set seed with other grasses. Wheat, oats, and barley are spring seeded grains while wheat and triticale can be planted in the fall. This article will review best management practices to produce high yield and quality forage from small grains. In addition, it will highlight the various attributes of the different grains suitable for New England agriculture.

Small Grain Selection:

There are many small grains suitable for forage in New England. It is a good idea to learn about the positive and also limiting characteristics of each grain. Ultimately, this will help you make a selection that is most suitable for your farm. When selecting a species, remember to make sure that it fits into your growing season and is adapted to your soil conditions. For example, do not seed grains in the fall if the winters are extremely harsh in your area. Overall, the grain species will not vary considerably in quality, although barley tends to be slightly higher in digestible energy and fiber (Table 1). However, the grains do vary in yield (Fig. 2). The following section outlines small grains that are common in this area.

Table 1. Average of yield and quality of various cereal grains harvested between boot and dough stage.

	DM Yield	CP	NDF	dNDF	IVTD
	t/ac	%	%	%	%
barley	1.9	154.2	61.2	61.7	71.6
oats	2.5	15.9	57.0	54.6	66.4
triticale	2.1	15.5	60.9	61.7	66.1
wheat	1.8	15.1	60.1	56.4	67.0

Barley is planted in the early spring. There are winter barley varieties but they are not hardy enough for our growing region. Studies at the University of Maine have indicated that winter barley rarely survives the harsh winters of New England. Therefore spring planted barley is the best option. Barley should be planted in early to mid May to maximize yields. Barley is best established on well drained soils. It generally does not perform well when grown on heavy textured soils that are prone to saturation. Simply put barley does not like "wet feet". Barley commonly yields less forage than the other cereal grains but overall forage digestibility is much higher



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Oats are probably the most widely grown small grain forage in New England. Oats are better adapted to cool wet soils than barley. Oats do not over winter and therefore must be planted in the spring. The oat forage yields are higher than the other small grains as oats tend to be leafier. To get the highest yields oats should be seeded in early to mid May. Oat forage quality is exceptionally high when the forage is harvested in the boot stage.

Wheat is one of the most versatile small grains as it can be planted in the spring or fall. Wheat should be planted in early to mid September to ensure adequate growth for dormancy. In the spring wheat should be seeded as soon as the soil can be prepared (April). Wheat is generally higher in quality than oats and triticale. It yields less than the other grains except barley.

Triticale is generally planted in the fall. This grain is a cross between rye and wheat. Some farmers have experienced varying success with wintering triticale. Generally triticale is more susceptible to winter kill than wheat. The Champlain Valley generally has good winter survival rates while the Northeast Kingdom region has reported varying success. Triticale quality is highest when harvested in the flag leaf or boot stage (prior to head emergence). Generally, yields are higher than wheat as they tend to be leafier.

Mixed Grains are planted to increase protein content of the forage mixture. A common mixture contains wheat, oats, and peas. A combination of cereal grain with peas can increase the protein content by 3 to 5 points.

Production Factors:

Once a cereal grain is selected there are many other production factors that must be considered to maximize forage yield and quality. The following sections outlines production factors that influence small grain yield and quality.

Planting Cereal Grains

It is important to plant small grains at the proper time to ensure high yields. In the case of fall seeded grains proper planting dates will also often determine the extent of winter survivability. It is recommended to plant fall seeded grains early to mid September. Fall seeding should be early enough to allow the crown of the plant to be well developed and 3-5 tillers present before overwintering. In addition, the plants need enough time to accumulate adequate stores of nutrients for the winter. Alternatively, seeding fall grains too early can lead to over-development of the plant resulting in a lack of winter hardiness. Spring seeded grains are cool weather crops, and perform better before the heat of summer. To avoid high temperatures, and reduce exposure to insects and pathogens, planting date for spring grains should be as early as possible. Cereal grains are well adapted to cool soils and can tolerate the early planting dates. Most farmers try to seed wheat in mid to late April. Other spring seeded grains (barley, oats, and mixed grains) are seeded in early to mid-May.

Pure stands of small grains planted for forage are commonly seeded at 125 - 150 lbs/acre. Spring grains should be seeded at the higher rate to reduce weed competition. Higher seeding rates can also reduce stem size of the grains. A reduced stem size will increase wilting speed of the forage. If a mixed grain is seeded it contains 80% small grain and 20% peas. Grain should be seeded at a depth of 1 inch. Plant stands are most uniform when planted with a grain drill. A broadcast seeder can be used to plant small grains. However, the field should be dragged and packed to cover the seed.



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Fertilization of Cereal Grains

Small grains require relatively low amounts of nutrients. A soil test is the best means to identify fertility requirements for your crops. Most of the needed fertility can be provided through adequate rotation and minimal manure or compost application. The optimal pH for small grain production is between 6.0 and 7.5.

Harvest Management

Fall seeded grains such as wheat and triticale can be grazed in the fall before winter dormancy. If grazing in the fall, make sure that the plant is well established, tillering, and 8 inches tall. This occurs 6 to 8 weeks after planting. Make sure that the plants are not over grazed before entering wintering. There should be 3 to 4 inches of stubble. Since triticale is more prone to winter kill it may be too risky to fall graze. Fall and spring seeded grains can both be grazed in the early spring. Many farmers have had success with spring grazing fall seeded triticale. Spring planting of grains can provide early season high quality pasture. Cereal grains can also be harvested for hay. However, the long curing time for cereal grain forage limits the production of hay. The feeding value of hay is generally less than that of baleage or silage. Cereal grain hay can be an excellent feed for calves, heifers, and dry cows. Grains that have awns can also cause irritation to cattle mouth, lips, gums tongue, and eyes. The best compromise between yield and quality occurs when small grains are harvested in the early milk stage. Silage or baleage is a popular means to harvest and store small grain forage.

Harvest timing of small grains will have a significant influence on cereal grain yield and quality. Similar to cool season grasses, cereal grains will lose quality and gain yield as the plant becomes more mature. Deciding when to harvest will be determined by the farm's forage requirements. There are typically three stages of identifiable plant maturities at which small grains are harvested- boot, milk, and dough stages. The boot stage is the time when the head is enclosed by the sheath of the uppermost leaf. The milk stage is when the grain head released a white liquid substance when opened. The dough stage is when the grain head begins to turn to a doughy consistency. As the plant matures from the boot stage to the dough stage, quality decreases while yield increases. If the goal is to harvest high quality feed (digestibility and protein) than small grains should be harvested in the flag leaf to boot stage. If high yields are the goal than harvest should occur in the late dough stage. If a compromise is desired than grains should be harvested in the early dough stages. If cereal grain harvest is delayed past the late dough stage than the forage may be too dry to ensile. The grain species will differ in their time to maturity. Barley is the earliest maturing grain species. Wheat and triticale are next in line and will mature 1 to 2 weeks earlier than oats (depending on the planting dates). Unlike some crops, cereal grains will progress from boot stage to dough stage in a relatively short period of time. They must be watched closely to harvest at your target time.

Table 2. Impact of harvest stage on yield and quality of cereal grains.

Harvest Stage		
Boot	Early Dough	
Dry Matter Yield (t/a)	1.5 - 2.5	3.0 - 4.0
Crude Protein (%)	16 - 18	10 - 12
Digestibility (%)	70 - 80	50 - 62

Cereal grains can be a very versatile crop and provide a variety of feedstuffs for your animals. Cereal grain selection will be based on your climate and personal preference. The type of feed harvested will be dependent on your feed needs from a quantity and quality perspective. Don't forget cereal grains also make great companion crops and cover crops.