



FORAGE PRODUCTION FROM SPRING CEREALS AND CEREAL — PEA MIXTURES

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Cereal crops can be successfully used as a source of forage for livestock. There are two situations where this practice should be used:

1. when alfalfa or other perennial forages are established using a cereal companion crop (a nurse crop), the cereal may be removed as forage to allow better establishment and more vigorous growth of the alfalfa
2. to provide an emergency source of forage when perennial forages have been damaged by winterkill.

The routine use of cereal crops for forage is usually not economically competitive with perennial forage crops (i.e., alfalfa-grass mixtures) in Ontario due to higher establishment costs. When harvested as forage, cereal crops are most commonly ensiled, but they also make excellent pasture and can be made into dry hay, although drying is more difficult than with perennial forages.

CROP MANAGEMENT

Cereal forage crops can be sown anytime from April to July, but early seeding is preferable for stored feed. Later seeding dates are satisfactory for summer pasturing. Cereals have greatly reduced yields when planted later in the spring or over summer. Early fall plantings can provide some grazing during October and November. Cereal forage seeding rates should be from 75 to 100 kg/ha. If cereals are sown in mixture with field peas, at least 50% (by weight) of the mixture should be peas and a total seeding rate of 110 to 130 kg/ha should be used. Adding peas to the mixture usually increases seed costs.

Fertilizer application should be based on a soil test. Refer to OMAFRA Publication No. 296 *Field Crop Recommendations* for P and K application rates. When the cereal crop is seeded down, the fertility requirements of the underseeded perennial forages should be met. Nitrogen application rates should be similar to cereal crops grown for grain (refer to OMAFRA Publication No. 296 for details). Chemical weed control should not be necessary if a vigorous

stand is achieved. Cutting the crop for silage will prevent most annual weeds from setting seed. If spraying is necessary, consult OMAFRA Publication No. 75 *Guide to Weed Control* for recommendations.

CEREAL SPECIES SELECTION

The most common cereals used for forage are oats, barley and spring triticale. Spring wheat can also be used but there is little Ontario data available on forage production from spring wheat. Forage yield of oats and barley are generally equal. Triticale is usually lower in yield than oats or barley, although it has shown higher yields in eastern Ontario (Table 1). In years where seeding is delayed by a late spring or where seedbed conditions are poor, oats will tend to outyield barley.

At the same stage of maturity, oats, barley, and triticale have similar feed quality. If the cereal is mixed with field peas and/or seeded down to alfalfa, triticale will usually give higher protein and lower neutral detergent fibre (NDF) levels. This is because triticale is less competitive than other cereals and the harvested forage will have greater amounts of peas and/or alfalfa present.

MIXTURES

Mixing field peas with a cereal grain for forage has become more common in the past several years. The primary benefit of peas mixed with small grains is to improve quality, with a possible boost in yield. Data from across Ontario suggests that triticale mixtures yield less than pure triticale (Table 1). Oat mixtures tend to yield equal to or greater than pure cereals in the south (Table 1), but may be lower than pure cereals in the north (Table 2). Traditionally, peas have been mixed with cereals at very low seeding rates (less than 20 kg/ha). This low rate of pea seed will not improve forage quality and will cause complications if spraying is required.

When peas form at least 50% of the sown mixture (by weight), producers can expect crude protein in the harvested forage to be 2 to 4 percentage points higher than with pure

cereals. Acid detergent fibre (ADF) content does not vary significantly between mixtures and pure cereals, but neutral detergent fibre levels are 2 to 4.5 percentage points lower in mixtures, resulting in a higher feed intake potential.

VARIETY SELECTION

The Ontario Forage Crops Committee (OFCC) conducts variety tests of cereal varieties and cereal-pea mixtures at five locations across Ontario. Cereal varieties that yield well for grain and straw should also produce acceptable forage yields. Table 1 summarizes the yields of cereals and cereal-pea mixtures in OFCC tests from 1994 to 1997.

Table 1 – Average yield (kg/ha) of oat, oat-pea, triticale, and triticale-pea entries¹ in OFCC tests.

	Kemptville ²	Elora	New Liskeard
Pure Oats	4509	5834	3720
Oats + Peas	4814	6189	4199
Pure Triticale	5007	5017	2820
Triticale + Peas	4486	4125	2627

¹Average of 5 oat, 7 oat-pea, 2 triticale, and 2 triticale-pea entries.

²Kemptville and Elora locations harvested at heads emerged stage, New Liskeard location harvested at early heading.

HARVEST MATURITY

Stage of maturity at harvest is the most important factor determining the yield and quality of a cereal crop when used as forage. In both oats and barley, forage yield increases by 90% to 110% as maturity changes from the boot stage (head beginning to emerge from the leaf whorl) to the soft dough stage. At the same time, crude protein drops by about 40%

to 50%, ADF and NDF levels increase by only 15% to 25%. This results in only a modest decline in energy content of the forage as the cereals mature and indicates that maximum yield of energy per acre will occur when the cereal is at the soft dough stage of development. With earlier (boot stage) harvest, a second cutting is possible if moisture conditions are favourable for good regrowth. Table 2 summarizes cereal silage yield and quality data from single-cut systems at New Liskeard in 1995 and 1996.

HARVEST HINTS

Annual forages cut at relatively immature stages are very high in moisture. For example, underseeded cereals and cereal-pea mixtures cut at the heads emerged stage, were 83% and 88% moisture at harvest, respectively. This forage must be wilted and conditioned just like a legume or legume-grass silage. Field scale plots at New Liskeard have also shown that mixtures with a high pea content wilt slowly. This may be a consideration for producers using storage systems that require extensive wilting before ensiling. Because cereal grains mature rapidly, harvest should begin slightly ahead of the maturity stage desired.

Very thick, lush cereal-pea mixtures can be difficult to cut. It is essential that mower conditioner knives and guards be in good condition and that reel speed and adjustment be set properly for efficient cutting of these crops. Lodged crops are almost impossible to cut cleanly. It is usually very difficult or impossible to cut cereals with a disk mower-conditioner as the machine pushes into the soft ground and plugs with soil. When cutting crops that have headed out, crimping rolls should be loosened or conditioners removed from swathers to reduce the loss of heads from the silage.

Table 2 – Summary Of Cereal Forage Yield And Quality (2 Year Average From New Liskeard).

	Boot	Headed	Milk	Dough
Forage Yield (kg/ha)				
Oats	4298	5389	6424	8504
Barley	4319	5664	6878	7676
Oats + Peas	3541 (14) ¹	4689 (15)	6997 (28)	7270 (35)
Barley + Peas	3532 (24)	4633 (28)	5925 (38)	8080 (42)
Forage Crude Protein (% of D.M.)				
Oats	16.4	13.5	10.1	8.4
Barley	16.6	13.3	10	6.9
Oats + Peas	18.2	15.4	12.2	10.3
Barley + Peas	18.6	15.9	14.0	11.3
Forage ADF (% of D.M.)				
Oats	35.2	40.9	43.5	43.3
Barley	35.5	39.8	40.1	45.8
Oats + Peas	37.2	41	42.1	43.5
Barley + Peas	36.4	38.9	38.7	42.5
Forage NDF (% of D.M.)				
Oats	53.7	60.1	61.2	62.4
Barley	56.1	61	58.8	68.8
Oats + Peas	52.6	57.7	57.8	59.8
Barley + Peas	53.3	57.5	54.3	60.3

FORAGE QUALITY AND FEEDING VALUE

Cutting or grazing of cereal forages can begin 6 to 8 weeks after seeding. Oats are preferred over barley for pasturing due to their higher palatability. When harvested at similar stages of maturity, the nutritional value of cereals are comparable. Maturity affects chemical composition more than species. Forage crude protein drops quickly after heading.

Cereal forage harvested in the boot stage has higher protein level and about the same energy level as corn silage. When harvested at the milk stage, it has about 10% less energy than corn silage (similar to alfalfa) and about 4 percentage units more protein than corn silage. The highest quality is when the harvested forage is in the boot stage, but the maximum energy harvested per hectare occurs at the soft dough stage.

Cereal silage can serve as the sole forage for late lactation, low producing, and dry dairy cows and can also be used successfully for feedlot cattle. Early-cut cereal forage may be lower in calcium and magnesium and higher in phosphorous than other forages. Be prepared to change mineral type and feeding rate when feeding cereal silage.

Nutritional value can only be determined by accurate sampling and feed analysis. Due to quality variations with maturity, use of book values of nutrient composition for cereal silage is not recommended. Wet chemistry laboratory analysis is recommended for cereal silage. Be sure to label the sample properly (i.e., first cut oat silage underseeded to alfalfa).

Addition of peas to cereals for silage or hay normally raises protein content by 3% to 4%. Pea protein is highly degradable, and rations may require a "bypass" protein supplement to properly balance the ration.

Conditioning and wilting of early-cut cereal silage prior to ensiling is desirable. Whole plant peas are lush, often containing 5% to 10% more moisture than cereals at harvest, which can result in an extra half day of drying time and increase the risk of weather damage. Because of this, cereal silage is rarely made into dry hay. As the crop matures, moisture content in the standing crop declines. At the soft dough stage, whole plant barley is approximately 60% moisture, while barley-pea mixtures are about 8 to 10 percentage units higher in moisture. At the same stage of maturity, oats tends to be higher in moisture content than barley. For some storage systems that require very wet forage (i.e., bunker silo), the standing crop may be too dry to ensile properly if left to the dough stage. Additional practices to help assure good quality feed are chopping at the recommended length of cut, thorough packing of the silage and covering bunker silos rapidly after filling.

CONCLUSION

Cereals are cool-season crops that are well-adapted to most parts of Ontario. Cereal silage can be produced on most livestock farms since the knowledge and equipment required for cereal production is already in place. Producers turn to cereal silage when emergency sources of forage are needed or when new stands of perennials such as alfalfa are being established. Depending on the management and harvest options selected, silage suitable for all classes of livestock can be produced.

RELEVANT OMAFRA PUBLICATIONS

Field Crop Recommendations, Publication No. 296
Guide to Weed Control, Publication No. 75

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