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DAIRY RESEARCH HIGHLIGHTS

University of Alberta

Cereal Silages
1. Feeding values and crop yields

Most Alberta dairy producers recognize the value of alfalfa hay and silage in production rations. The quality of alfalfa harvested has increased over the past 20 years to the extent that very little straight alfalfa fed to lactating dairy cows today tests lower than about 17% crude protein. In addition, since we have come to recognize the importance of undegradable protein for early lactation cows, we now realize that very high (greater than 20%) crude protein alfalfa is more efficiently utilized by the cow when it is blended with cereal silage.

There are several other reasons why dairy producers may be interested in growing and feeding cereal silages :

- high-yielding crops can be grown in a wide variety of climatic and soil conditions;
- they are more drought resistant than alfalfa and, therefore, are better adapted to long, dry summers;
- spring-seeded cereals are not subject to winter kill.

We recently completed a series of experiments to determine the optimum harvest stage and relative feeding values of barley, oat and triticale silages as well as an intercropped mixture of barley silage and winter triticale. In this article, we report our findings on the changing nutrient content of these crops as they approach harvest at the soft dough stage and after ensiling. In a future article, we will discuss the results of feeding each of the four silages to lactating cows.

Effect of maturity on nutrient value

Figure 1 shows changes in the crude protein, neutral detergent fibre (NDF) and Net Energy for lactation (NE_l) levels in each of the crops as they mature. NE_l concentrations were estimated from acid detergent fibre (ADF) levels.

Crude protein concentrations declined steadily in all four crops as they approached the soft dough stage, although the rate of decline was lower in the last three weeks. At harvest, the differences between crops were insignificant, ranging from 10.5% for oats to 11.2% for triticale.

NDF reached a peak two to three weeks before harvest and, conversely, NE_l levels were lowest at the same time. These changes reflect changes in crop composition. As the crops mature, leaves and stems become more fibrous and their digestibilty (NE_l value) declines. At the same time, head filling reduces overall crop fibre levels and increases digestibility.

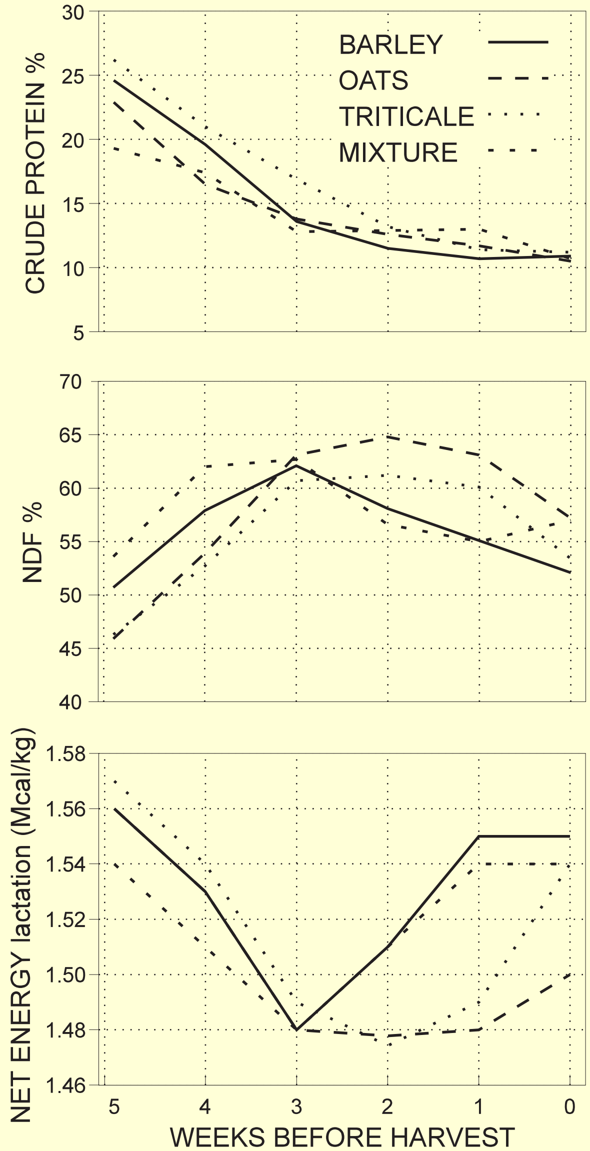

Figure 1 : Changes in feeding value (100% dry matter basis) of cereal silages as they approach harvest at the soft dough stage.

CEREAL	DM %	DRY MATTER YIELD tonnes/ha	tons/acre
BARLEY	45.6	7.70	3.43
OATS	36.4	6.72	3.00
TRITICALE	36.9	6.33	2.82
MIXTURE	46.4	8.10	3.61

Table 1 : Dry matter (DM) % and dry matter yield at harvest for cereal silages grown at the University of Alberta Research Station, Edmonton.

As shown in Table 1, dry matter yields for barley, oats and triticale were similar and not significantly different from one another. But dry matter yield of the barley-winter triticale mixture was substantially higher than the oats and triticale.

It might be tempting to harvest these cereals earlier to take advantage of higher protein levels, but a penalty would be paid in both NE_l value and crop yield. For example, if the barley silage were harvested 3 weeks earlier (milk stage), crude protein concentration would have been close to 14% but NE_l was only 1.48 Mcal/kg. More importantly, Alberta Agriculture figures indicate that crop yield would be less than 60% of the yield at the soft dough stage.

Silage quality

At harvest, the crops were packed in silage bags. At one week, one month and three months after ensiling, three core samples were taken at ¼, ½ and ¾ of the length of each bag. Results for individual samples of each silage type were averaged and the average results are reported in table 2.

CEREAL	DM ------	NUTRIENT CP % of DM	NDF ------	NEl Mcal/kg
BARLEY	44.8^{b}	12.0^{ab}	50.2^{c}	1.54^{c}
OATS	40.0^{c}	11.4^{b}	60.6^{a}	1.49^{a}
TRITICALE	33.8^{d}	12.4^{a}	54.2^{b}	1.52^{b}
MIXTURE	46.6^{a}	11.8^{ab}	50.1^{c}	1.55^{c}

Table 2 : Average nutrient levels in cereal silages. Averages in the same column with different superscripts are significantly different ($p<0.05$). For an explanation of statistical significance, see article ***1F2*** *in this series.*

The crude protein concentration in the triticale silage was significantly higher than that in the oat silage, but neither of these were different from the CP% in the barley or the barley-winter triticale mixture.

NDF% was lowest in the barley silage and the mixture and these were not significantly different from one another. The NDF% in the oat silage was significantly higher than in any of the others. Triticale NDF% was sigificantly higher than oats but significantly lower than barley and mixed silage.

Net Energy for lactation (NE_l) is estimated from acid detergent fibre (ADF) % and, since NDF and ADF are closely correlated, relative NE_l values reflect NDF values. Barley and mixed silage NE_l levels were significantly higher than those in either oat or triticale silages.

Conclusions

Nutrient analysis of these cereal crops as they matured confirmed that the soft dough stage was the optimum time to harvest. Although earlier harvesting may result in higher crude protein levels, both Net Energy and total crop dry matter yields will be lower.

Dry matter yield of the intercropped mixture of barley and winter triticale was higher than that of oats or triticale alone. Since the feeding value of the ensiled mixture was at least as good as any of the single species, this crop may be a good choice for silage production in parts of Alberta where soil type and climatic conditions are similar to those at the University of Alberta Research Centre.

researchers :
Reza Khorasani (r) and John Kennelly (l)