

Changes in yield and composition of barley, wheat and triticale grains with advancing maturity.

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Introduction

Traditionally, cereal grains in Ireland (barley and wheat) grown for ruminant feeding are harvested when the grains are mature, with a DM concentration of > 800 g/kg. The grains are subsequently either dried or treated with propionic acid, and rolled prior to feeding. Triticale (rye x wheat) can be grown on marginal land and has potential as a livestock feed in Ireland. Currently there is interest in Ireland in harvesting these grains at an earlier stage of development (immature) and storing them anaerobically before feeding. This experiment quantified the effects of cereal type (i.e. barley, wheat and triticale) and the stage of development at harvesting on the yield and composition of grain.

Materials and methods

Plots of winter barley (32m x 2.4m; *cv.* Regina; sown 9 October 2001; 150 kg N/ha), winter wheat (24m x 2.4m; *cv.* Falstaff; sown 30 October 2001; 224 kg N/ha) and a semi-dwarf variety of triticale (40m x 2.4m; *cv.* Fidelio; sown 26 October 2001; 180 kg N/ha) were grown at Oak Park, and managed as for commercial grain production. The target dry matter (DM) contents at harvesting were 600, 660, 720, 780 and ≥800 g/kg. The 20 plots for each cereal were arranged in a randomised complete block design with 5 harvest times and four replicate blocks. A separate ANOVA for each cereal was executed and the model took harvest date and replicate blocks into account. Plots were harvested using a plot combine-harvester (Deutz Fahr Farmliner 3370, with a 2.4m cutting width) equipped with a built-in grain collection and weighing system to determine plot yields (uncorrected for shedding

and harvesting losses). Harvested grains were sampled for subsequent laboratory analysis.

Results and Discussion

Barley grain changed over a 13-day interval from a mean DM concentration of 539 g/kg on 5 July to 854 g/kg on 18 July (Table 1). This rapid rate of moisture loss from grains reflected the preceding and prevailing weather conditions, and resulted in the crop being sampled at four rather than five harvest dates. Fresh yields correspondingly decreased ($P < 0.001$), reflecting mainly the evaporation of water from the grains. Grain DM yield was highest between 5 and 15 July and fell significantly ($P < 0.001$) by 18 July. The change in dry matter digestibility (DMD) over time was not significant ($P > 0.05$), indicating that it is not affected by the maturation of the crop over time.

Wheat grain changed during the 15-day interval from a mean DM concentration of 580 g/kg on 6 August to 818 g/kg on the 21 August (Table 1). Due to variable prevailing weather conditions, the rate of change in DM concentration was uneven. Simultaneously, the fresh yield of wheat grain fell over time ($P < 0.001$). However grain DM yields did not differ ($P > 0.05$) across the 5 harvest dates, indicating that the DM yield reached a plateau as early as 6 August. The wheat grain DMD was not significantly affected by increasing crop maturity over the 15-day interval ($P > 0.05$), with DMD values between 888 and 902 g/kg. Triticale grain changed during the 21-day interval from a mean DM concentration of 561 g/kg on 12 August to 826 g/kg on 2 September (Table 1). The fresh yield of triticale grain fell over time from 14.9 t/ha on 12 August to 10.0 t/ha on 2 September ($P < 0.001$). However grain DM yield did not vary ($P > 0.05$) across the 5 harvest dates. The triticale grain DMD did not change significantly ($P > 0.05$) over the 21-day interval, with DMD values between 881-896 g/kg.

Conclusions

Although fresh grain yields of barley, wheat and triticale decreased with advancing maturity, changes in DM yield and DMD values were relatively modest or absent.

Table 1: Yield (uncorrected) and composition of grains from the sequential harvesting of cereal crops 2002

Barley						
Harvest date	5 July	12 July	15 July	18 July	SEM	Sig.
Yield harvested (t/ha)						
Fresh	11.2	8.3	6.9	6.2	0.107	***
DM	6.0	5.9	5.8	5.3	0.066	***
Composition						
DM (g/kg)	539	711	824	854	3.210	***
DMD (g/kg)	872	866	861	867	3.110	NS
Wheat						
Harvest date	6 Aug	12 Aug	14 Aug	19 Aug	21 Aug	
Yield harvested (t/ha)						
Fresh	16.4	15.3	14.5	12.5	11.7	0.29
DM	9.5	10.3	9.6	9.8	9.6	0.17
Composition						
DM (g/kg)	580	672	664	784	818	9.50
DMD (g/kg)	902	891	900	888	891	4.58
Triticale						
Harvest date	12 Aug	19 Aug	21 Aug	27 Aug	2 Sept	
Yield harvested (t/ha)						
Fresh	14.9	11.8	10.7	9.9	10.0	0.23
DM	8.3	8.0	8.0	8.0	8.2	0.15
Composition						
DM (g/kg)	561	681	751	811	826	3.6
DMD (g/kg)	893	888	887	881	896	4.8