

# Evaluation of New Fall Rye Cultivar ‘Bono’ in Single and Double Cropping Systems

Enkhjargal Darambazar <sup>1</sup>, Kathy Larson <sup>2</sup>, Daalkhaijav Damiran <sup>1</sup>, and Herbert A. Lardner <sup>1,\*</sup>

<sup>1</sup> Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK S7N 5A8, Canada; end172@usask.ca (E.D.); daal.damiran@usask.ca (D.D.)

<sup>2</sup> Department of Agricultural and Resource Economics, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, SK S7N 5A8, Canada; kathy.larson@usask.ca (K.L.)

\* Correspondence: bart.lardner@usask.ca (H.A.L.)

**Supplemental Table S1.** One-way ANOVA results of spring barley nutrient composition

Item	DF†	Sum of Square	Mean Square	F	p-value
Basic chemical profile (g kg <sup>-1</sup> DM)					
ash	1	0.276	0.276	1.100	0.313
acid detergent fibre	1	0.640	0.640	0.080	0.786
neutral detergent fibre	1	8.410	8.410	0.430	0.523
crude protein	1	4.203	4.203	1.600	0.227
Total digestible nutrients	1	0.250	0.250	0.040	0.839
Relative feed value (RFV)	1	49.000	49.000	0.170	0.687
Energy values (Mcal kg <sup>-1</sup> DM)					
net energy for gain	1	0.000	0.000	0.060	0.808
net energy maintenance	1	0.001	0.001	0.110	0.743
Macro minerals (g kg <sup>-1</sup> DM)					
calcium	1	0.001	0.001	1.700	0.213
phosphorus	1	0.0002	0.0002	0.290	0.600
potassium	1	0.017	0.017	19.240	0.001
magnesium	1	0.004	0.004	4.710	0.048
sodium	1	0.044	0.044	1.520	0.238
Micro minerals (mg kg <sup>-1</sup> DM)					
copper	1	0.00000	0.00000	0.00000	1.000
zinc	1	0.00000	0.00000	0.00000	1.000
iron	1	1722.250	1722.250	0.890	0.361
manganese	1	72.250	72.250	5.570	0.033

*Note.* †Treatments: BonoFR, fall rye cv. Bono; HazletFR, fall rye cv. Hazlet; Barley-BonoFR, double cropping treatment barley followed by BonoFR; Barley-HazletFR, double cropping treatment of early spring barley (cv. Maverick) followed by HazletFR.

**Supplemental Table S2.** One-way ANOVA results of winter cereal nutrient composition

Item	DF†	Sum of Square	Mean Square	F	p-value
Basic chemical profile (g kg <sup>-1</sup> DM)					
ash	4	15.566	3.891	1.570	0.209
acid detergent fibre	4	80.842	20.210	0.820	0.523
neutral detergent fibre	4	207.590	51.898	1.040	0.402
Crude protein profile (g kg <sup>-1</sup> DM)					
crude protein (CP)	4	51.490	12.873	0.820	0.521
soluble protein	4	8.285	2.071	1.160	0.346
soluble protein (%CP)	4	145.198	36.300	1.790	0.157
rumen degradable CP	4	23.449	5.862	0.870	0.495
rumen degradable CP (%CP)	4	36.490	9.123	1.790	0.158
Total digestible nutrients	4	27.421	6.855	0.320	0.862
Relative feed value	4	1870.000	467.500	0.710	0.593
Energy values (Mcal kg <sup>-1</sup> DM)					
net energy for gain	4	0.032	0.008	1.870	0.141
net energy for maintenance	4	0.039	0.010	0.650	0.632
Macro minerals (g kg <sup>-1</sup> DM)					
calcium	4	0.002	0.001	0.090	0.984
phosphorus	4	0.004	0.001	0.570	0.689
potassium	4	1.815	0.454	2.970	0.035
magnesium	4	0.004	0.001	0.280	0.887
sodium	4	0.033	0.008	0.700	0.598
Micro minerals (mg kg <sup>-1</sup> DM)					
copper	4	12.667	3.167	0.500	0.735
zinc	4	372.400	93.100	0.550	0.700
iron	4	20855.143	5213.786	0.630	0.643
manganese	4	1184.171	296.043	0.420	0.791

*Note.* †Treatments: BonoFR, fall rye cv. Bono; HazletFR, fall rye cv. Hazlet; PikaWT, winter triticale cv. Pika; Barley-BonoFR; double cropping treatment barley (cv. Maverick) followed by BonoFR; Barley-HazletFR, double cropping treatment of spring barley followed by HazletFR.

**Supplemental Table S3.** One-way ANOVA results for dry matter yield, nutrient yield and uptake, and N use efficiency of barley and winter cereals

Item	DF†	Sum of Square	Mean Square	F	p-value
<b>DMY, kg ha<sup>-1</sup></b>					
barley	1	762325.44	762325.44	0.04	0.843
winter cereal	4	449108.00	112277.00	0.1	0.982
total	4	266456723.70	66614180.90	5.05	0.003
<b>CPY†, kg ha<sup>-1</sup></b>					
barley	1	2043.27	2043.27	0.01	0.911
winter cereal	4	4482.53	1120.63	0.05	0.995
total	4	1931614.27	482903.57	3.76	0.014
<b>TDNY, kg ha<sup>-1</sup></b>					
barley	1	319354.96	319354.96	0.04	0.849
winter cereal	4	119077.56	29769.39	0.07	0.990
total	4	120407988.30	30101997.10	5.27	0.002
<b>Mineral uptake</b>					
<b>Nitrogen, kg ha<sup>-1</sup></b>					
barley	1	52.27	52.27	0.01	0.911
winter cereal	4	114.79	28.70	0.05	0.995
total	4	49448.24	12362.06	3.75	0.014
<b>Phosphorus, kg ha<sup>-1</sup></b>					
barley	1	1.11	1.11	0.01	0.917
winter cereal	4	1.44	0.36	0.07	0.990
total	4	1410.61	352.65	4.97	0.003
<b>Potassium, kg ha<sup>-1</sup></b>					
barley	1	1.00	1.00	0	0.976
winter cereal	4	411.67	102.92	0.16	0.958
total	4	12721.52	3180.38	1.86	0.143
<b>N use efficiency</b>					
barley	1	184.54	184.54	0.84	0.376
winter cereal	4	270.91	67.73	1.18	0.340
total	4	5555.16	1388.79	25	<0.001

Note. †Treatments: BonoFR, fall rye cv. Bono; HazletFR, fall rye cv. Hazlet; PikaWT, winter triticale cv. Pika; Barley-BonoFR, double cropping treatment barley (cv. Maverick) followed by BonoFR; Barley-HazletFR, double cropping treatment of spring barley followed by HazletFR; Total, barley CPY/TDNY + fall rye CPY/TDNY