

Application Note 164: Measurement of DE (Digestible Energy) and AME (Apparent Metabolisable Energy) in Wheat, Barley and Triticale using the CropScan 1000B Whole Grain Analyser



Introduction:

Pig, poultry and cattle are fed feed rations that include whole and milled grains such as wheat, barley and triticale. Protein and Test Weight have been important criteria upon which the farmers buy their grains. However studies performed by the CRC Pig Research, Roseworthy College, SA, have shown that DE for pigs and AME for poultry are far more important in the assessment of grains for feed rations.

NIR Technology Systems was involved in a study to assess the suitability of NIR whole grain analysers for measuring DE and AME in common grains such as wheat, barley, triticale and sorghum. The CropScan 2000B NIR Analyser was shown to be on par with the research NIR analyser used by the CRC to develop calibrations. As such the CRC through their company, AusScan Pty Ltd, allowed NIR Technology Systems access to their test grains in order to develop a set of calibrations for DE and AME to be used with the CropScan range of whole grain analysers. Approximately 210 samples of grains that had In Vivo animal trials performed on them, were scanned using a CropScan 1000B in 2008. The spectra were supplied to Dr. Peter Flynn, AusScan Pty Ltd, who developed calibrations for DE and AME.

This study presents data showing the results of measuring samples of wheat, barley and triticale using the calibrations developed by AusScan.

Procedure:

A CropScan 1000B made by NIR Technology Systems with a 16mm flow cell and built in Test Weight was used to measure the protein, TW, DE and AME for samples of wheat, barley and triticale. The samples were then submitted to AusScan for analysis using their master NIR analyser, XDS, Foss Electric.

Results:

Table 1. presents the prediction of wheat and barley samples.

Sample ID	CropScan				AusScan				Diff DE	Diff AME
	DE	AME	Protein	TW	DE	AME	DE	AME		
Wheat										
W100	14.3	12	9.4	75	W100	13.7	12.4	-0.6	0.4	
W12152	14.4	12.1	15.1	74.6	W12152	14.3	12.2	-0.2	0.1	
W12983	14.6	12	13.9	79	W12983	14.2	12.1	-0.4	0.1	
W3	14.3	12	9.4	72.2	W3	13.7	12.4	-0.6	0.4	
W4	14.7	11.5	11.4	70.2	W4	14.2	12.5	-0.5	1.0	
WA11	14	11.8	12.7	83.2	WA11	14.0	11.8	0.0	0.0	
WA17	14.4	12	12.4		WA17	14.1	12.2	-0.3	0.2	
WA22	14.4	12.2	11.4	76.8	WA22	13.9	12.4	-0.5	0.2	
WA4	14	11.8	13.6	79.8	WA4	13.7	13.3	-0.3	1.5	
Ave	14.3	11.9	12.1	76.35		14.0	12.4	Bias -0.3	0.4	
SD	0.24	0.21	1.95	4.24		0.22	0.41	SEP 0.20	0.50	

Barley									
B REXJ	12.8	10.3	9.4	67.6	B REXJ	13.1	11.1	0.3	0.8
B2010101	13.8	10.9	11.8	66.2	B2010101	13.2	10.9	-0.6	0.0
B290	13.8	11	9.7	64.8	B290	12.8	11.1	-1.0	0.1
B30	13.7	10.7	8.8	64.6	B30	12.6	11.3	-1.1	0.6
B38	13.6	10.4	12.9	66.7	B38	12.9	11.0	-0.7	0.6
B54	13.3	10.8	9.5	67	B54	12.7	10.9	-0.6	0.1
B73	13.1	10.6	9.8	72.4	B73	13.1	11.4	0.0	0.8
BA14	13.2	10.9	9.6	62.8	BA14	12.8	11.0	-0.4	0.1
BT9	13.6	10.6	12	68.6	BT9	13.4	11.2	-0.2	0.6
Ave	13.4	10.7	10.4	66.7		12.9	11.1	Bias -0.5	0.4
SD	0.35	0.24	1.44	2.75		0.3	0.2	SEP 0.45	0.34

Figure 1. shows the plot of the predicted DE vs the AusScan master calibration DE for wheat and barley. Note the Predicted DE values were bias adjusted.

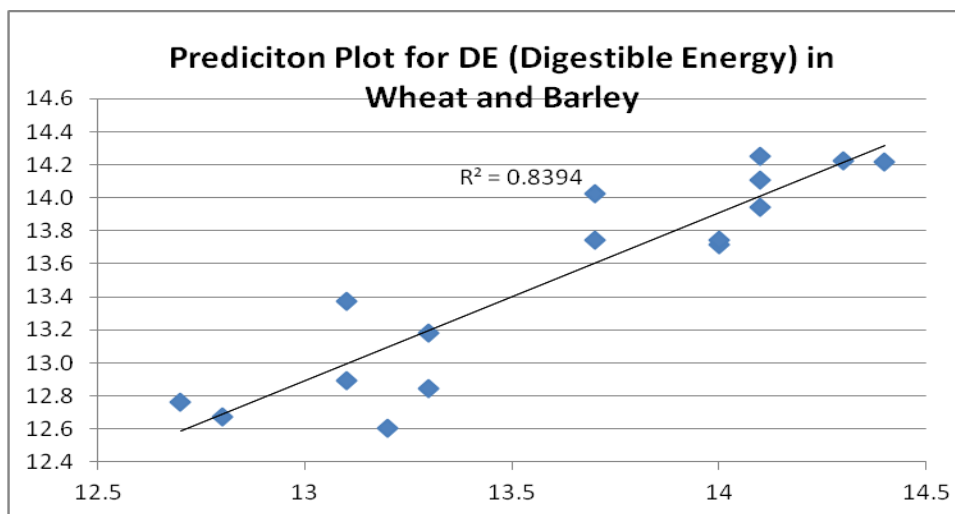


Figure 2. shows the plot of the predicted AME vs the AusScan master calibration AME for wheat and barley. Note the Predicted AME values were bias adjusted.

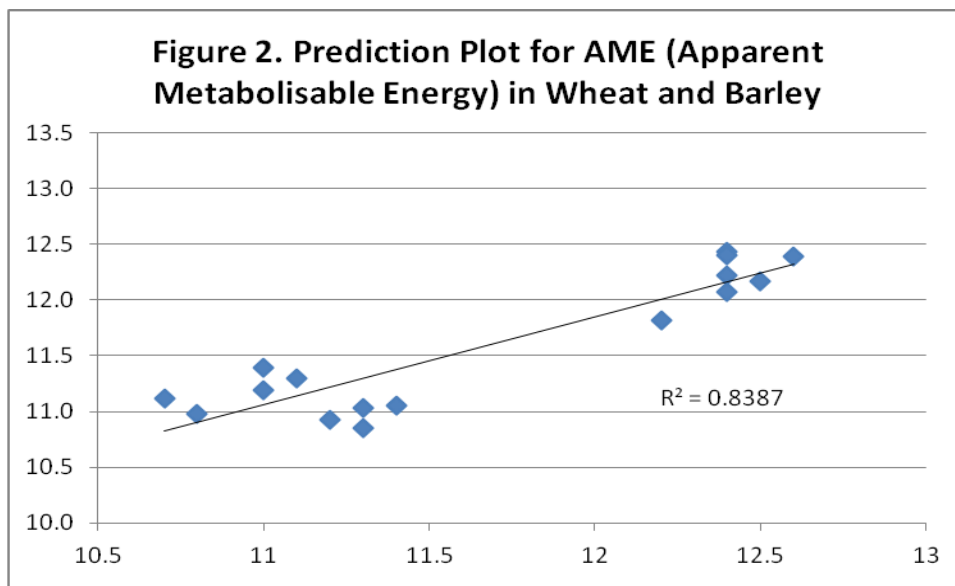


Table 2. presents predicted DE and AME data for Triticale.

Triticale ID	DE	AME
134	13.7	12.6
135	13.5	12.3
136	13.9	12.2
137	13.2	11.9
138	13.6	12.1
139	13.2	11.5
140	12.8	11.8
141	13.5	12.8
142	13.5	12.4
143	13.4	12.6
144	13.5	12.5
145	13.4	12.5

There was no reference data available for these samples of Triticale.

Table 3. presents data for a separate set of Triticale samples analysed using the AusScan master NIR analyser.

**NIR-predicted pig faecal DE and broiler AME (MJ/kg as fed)
for 10 triticale samples**

Foss XDS (Master)

Sample	DE	AME
S1	13.66	11.65
S2	13.71	12.32
S3	13.73	12.15
S4	13.87	12.23
S5	13.60	11.44
S6	14.01	12.16
S7	13.97	12.11
S8	13.79	11.86
S9	13.94	12.28
S10	13.94	12.17
Average	13.82	12.04

Discussion:

This study demonstrates that the AusScan calibrations for DE and AME as applied to wheat and barley are measured by the CropScan 1000B Whole Grain Analyser with an accuracy consistent with the original calibration data. The data for triticale is consistent with DE and AME data obtained on another sample set of triticale measured using the AusScan master NIR analyser.