

App Note 189. Tallow Analysis - using NIR Transmission Technology

Introduction

This study shows the use and accuracy of the MultiScan Series 3000 to measure FFA and moisture in tallow. The results in this study show the MultiScan prediction for FFA and Moisture compared to the lab's titration and oven method.

Instrumentation

The MultiScan S3000 Food Analyser is a Near Infrared Transmission spectrometer equipped with a rotating sample cup. The instrument uses a diode array spectrometer to scan the wavelength region 720-1100nm at a resolution of 10nm. The instrument scans the sample ten times and average of the sub scans in the final predicted result in 60 seconds.

Calibration

260 Tallow samples were analysed using the MultiScan Series 3000 and tested by Fletchers International internal lab for FFA and Moisture. A Partial Least Squares Regression was performed on the combined calibration file using NTAS (NIR Technology Analysis Software) to develop calibration model for FFA and moisture. The calibration models were then used to predict samples outside of the calibration set.

Results

Calibration Data

Figure 2.1, below, shows the NIT spectra for the Tallow samples using Absorbance spectra.

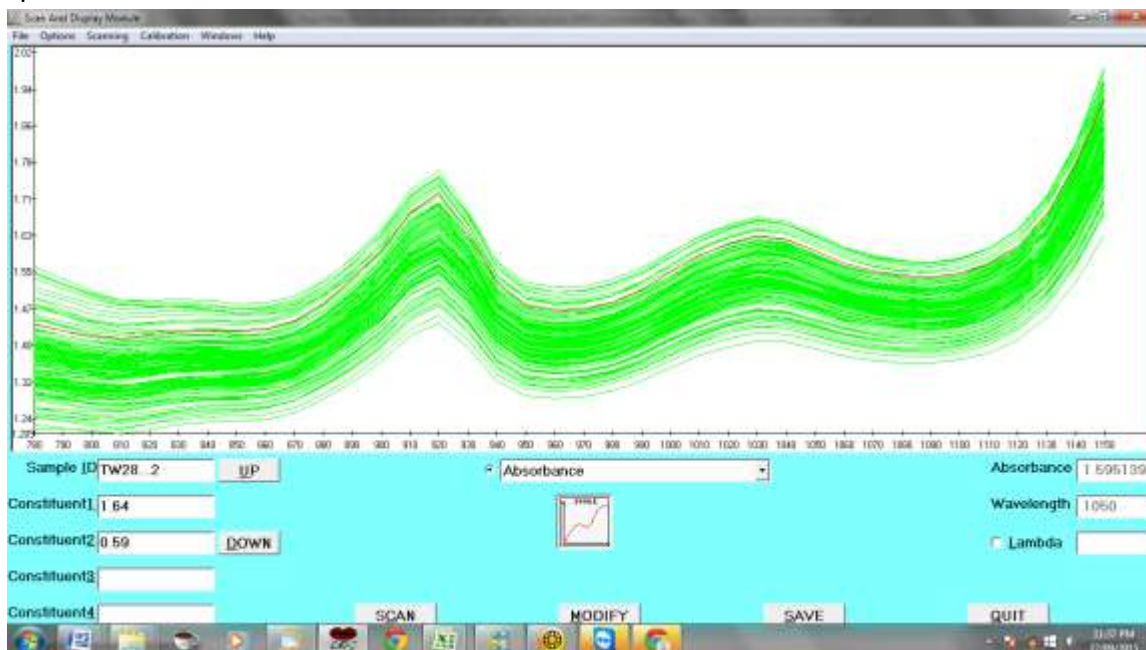
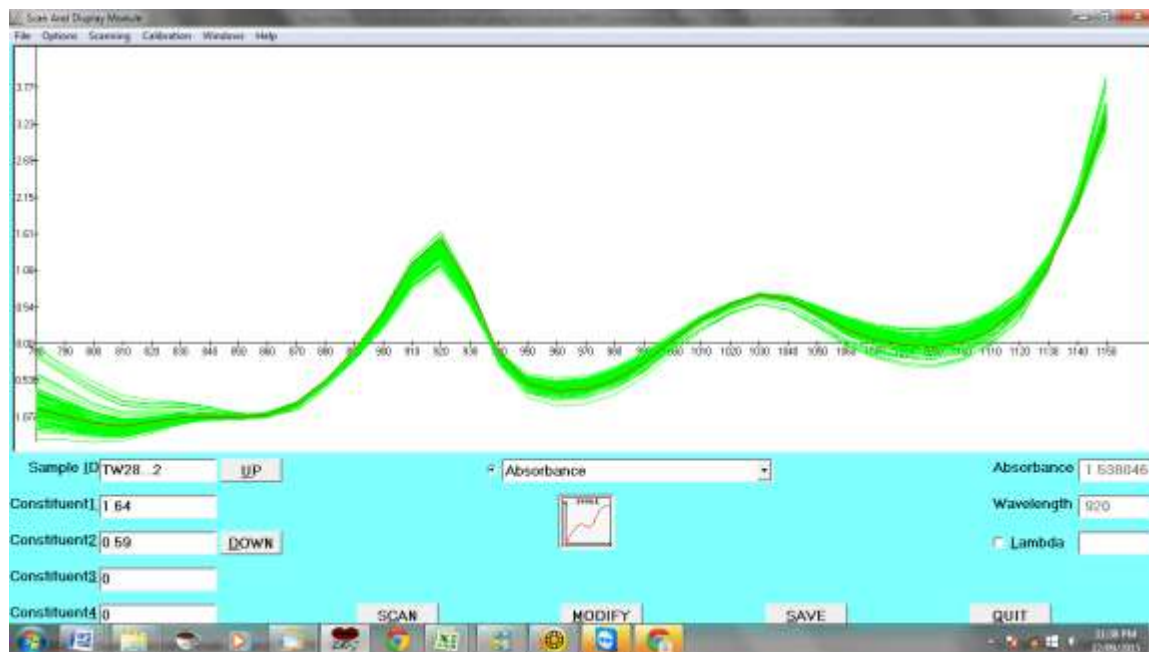


Figure 2.1: Plot of NIR Spectra for Tallow

Figure 2.2, below, shows the NIT spectra for the Tallow samples using Standard Normal Variate spectra.



Prediction

31 samples scanned and analysed over a two-week period. The table below shows the predicted results for both.

Table 1: Predicted MultiScan Vs Lab for FFA and Moisture.

Sample ID	MultiScan	LAB	MultiScan	LAB	Difference	Difference
	FFA	FFA	Moisture	Moisture	FFA	Moisture
333	2.03	1.91	0.2	0.14	-0.12	-0.06
334	1.69	1.83	0.21	0.1	0.14	-0.11
335	1.62	1.65	0.12	0.19	0.03	0.07
336	1.73	1.58	0.15	0.09	-0.15	-0.06
337	1.59	2.02	0.22	0.15	0.43	-0.07
338	1.7	1.86	0.26	0.74	0.16	0.48
339	1.71	1.43	0.32	0.19	-0.28	-0.13
340	1.5	1.4	0.38	0.51	-0.1	0.13
341	1.64	1.43	0.35	0.44	-0.21	0.09
342	1.92	1.68	0.3	0.3	-0.24	0
343	1.75	1.62	0.2	0.09	-0.13	-0.11
344	1.76	1.6	0.3	0.29	-0.16	-0.01
345	1.77	1.77	0.18	0.15	0	-0.03

346	1.86	1.76	0.37	0.2	-0.1	-0.17
347	1.68	1.75	0.25	0.49	0.07	0.24
348	1.66	1.5	0.52	0.45	-0.16	-0.07
349	1.62	1.57	0.27	0.35	-0.05	0.08
350	1.7	1.76	0.48	0.5	0.06	0.02
351	1.68	1.76	0.62	0.75	0.08	0.13
352	1.61	1.76	0.5	0.55	0.15	0.05
353	1.87	1.79	0.25	0.25	-0.08	0
354	1.78	1.76	0.47	0.4	-0.02	-0.07
355	2.08	1.85	0.35	0.3	-0.23	-0.05
356	2.04	1.86	0.3	0.35	-0.18	0.05
357	1.98	1.35	-0.24	0.09	-0.63	0.33
358	1.65	1.65	0.21	0.2	0	-0.01

Bias	-0.07	0.03
SEP	0.19	0.14

Conclusion

This study shows the MultiScan Series 3000 is well suited to measure FFA and Moisture in Tallow. The speed, ease of sample prep and minimal training required to operate the MultiScan are the true benefits of this type of Analyser compared to the titration method and oven. The ability to quickly load a sample cell and analyse under 60 seconds allows the operators to run more samples to give better batch monitoring. The level of accuracy shown from the 30 check samples are well within this applications scope of 0.19% for FFA and 0.14% for Moisture.