Application Note 18
Quality Screening for Fresh and Old Dried Basil Leaves Used as Seasoning.

By Olivia Koper and Ted Zhang December 2000

1. Introduction

The customer is interested in determining the freshness of dried basil seasoning. The goal in developing this method was to determine if the Cyranose 320 can be used to identify fresh dried basil and year old dried basil. The customer provided samples of fresh and old basil.

2. Experimental

Sample preparation:
The samples of basil were sent in 250-mL sealed glass jars. One jar was sent of fresh (one month old) dried basil leaves and another jar was sent of one year old dried basil leaves. Samples of fresh and old basil were filled into 40-mL headspace vials fitted with a Teflon-lined septum. Each vial was half full. Five replicates were prepared for each sample. Fresh samples were prepared for prediction and all samples were kept in a laboratory environment at ambient conditions. The samples were analyzed at room temperature. The total sampling time was 3 minutes. A 45 second sample exposure time was chosen to ensure that all sensors reached equilibrium. Random sampling sequence was used to build the training set. The humidity was kept low by using syringes filled with drierite both on the purge inlet and sample venting needle as shown in Figure 1. To maintain a dry air system we purged the sample inlet with dry air using drierite in a 40-mL vial as shown in Figure 2.

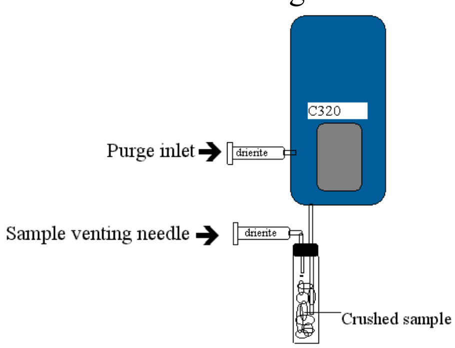

Figure 1. Drying air through purge inlet to establish baseline and drying air for sample vent.

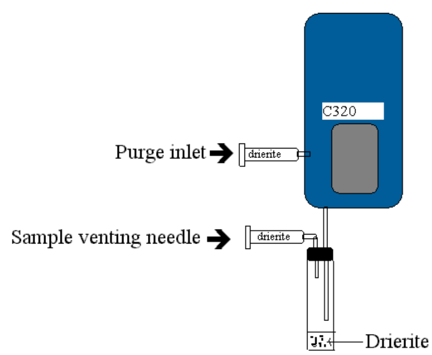

Figure 2. Purging the sample inlet with dry air.

Testing Conditions:
The Cyranose 320 with a 32 sensor array was used to test the fresh and old dried basil. Four of the sensors, sensors 5, 6, 23 and 31, were deselected due to their sensitivity to polar compounds. The method settings used are in Table 1.

Data handling:
Data was recorded with the digital filter on. The sensor responses were calculated as $(R_{max}-R_{min})/R_{min}$ where R_{min} is the minimum of the resistance reading during the baseline purge and R_{max} is the maximum resistance reading during the vapor exposure. Canonical discriminant analysis (CDA), an algorithm for pattern recognition, with auto-scaling and 1-normalization was used for model-making and predictions. Identification quality for predictions was set at medium.

3. Results

The discrimination of the two seasonings with principal components analysis (PCA) and CDA, are shown in Figures 3 and 4 respectively. The two seasonings are clearly separated. The interclass distance and internal cross validation results of the two basil seasonings are shown in Figure 5. The first table in Figure 5 shows that all ten exposures to Fresh Basil (BN) were identified as fresh basil using the CDA model. Similarly, the ten samples trained as Old Basil (BO) were correctly identified as old basil. This led to 100% correct internal cross validation. The second table in Figure 5 gives an indication of how far apart the two basil classes are in the model. The interclass distance was 13.2, which indicated good discrimination between the two basil samples.

The obtained prediction results collected over a 9 day period are listed in Table 2 with medium identification quality.

Table 2. Canonical Prediction Results of Two Seasonings

	Fresh Basil (BN)	Old Basil (BO)
1st Day	5/5 *****	5/5 *****
2nd Day	5/5 *****	5/5 *****
9th Day	5/5 *****	5/5 *****

The basil samples were correctly classified 100% of the time with high confidence. The training set was externally validated during a 9 day period and was shown to be robust and reliable over this time.

4. Conclusions

A method for the identifying fresh dried basil from one year old dried basil was successfully created and used for 9 days. The experiment was then terminated.

Table 1. Method setting used in the experiments.

Method name	Seasonings	
Class 1	Fresh Basil (BN)	
Class 2	Old Basil (BO)	
Baseline purge	20	Medium
Sample draw	45	Medium
Sample draw 2	0	
Snout removal	0	
1st sample gas purge	0	
1st air intake purge	5	High
2nd sample gas purge	90	High
2nd air intake purge	20	High
Digital filtering	On	
Substrate heater	On	32 °C
Training repeat count	1	
Identifying repeat count	1	
Active sensors	All except 5, 6, 23, 31	
Algorithm	Canonical	
Preprocessing	Autoscaling	
Normalization	Normalization 1	
Identification Quality	Medium	

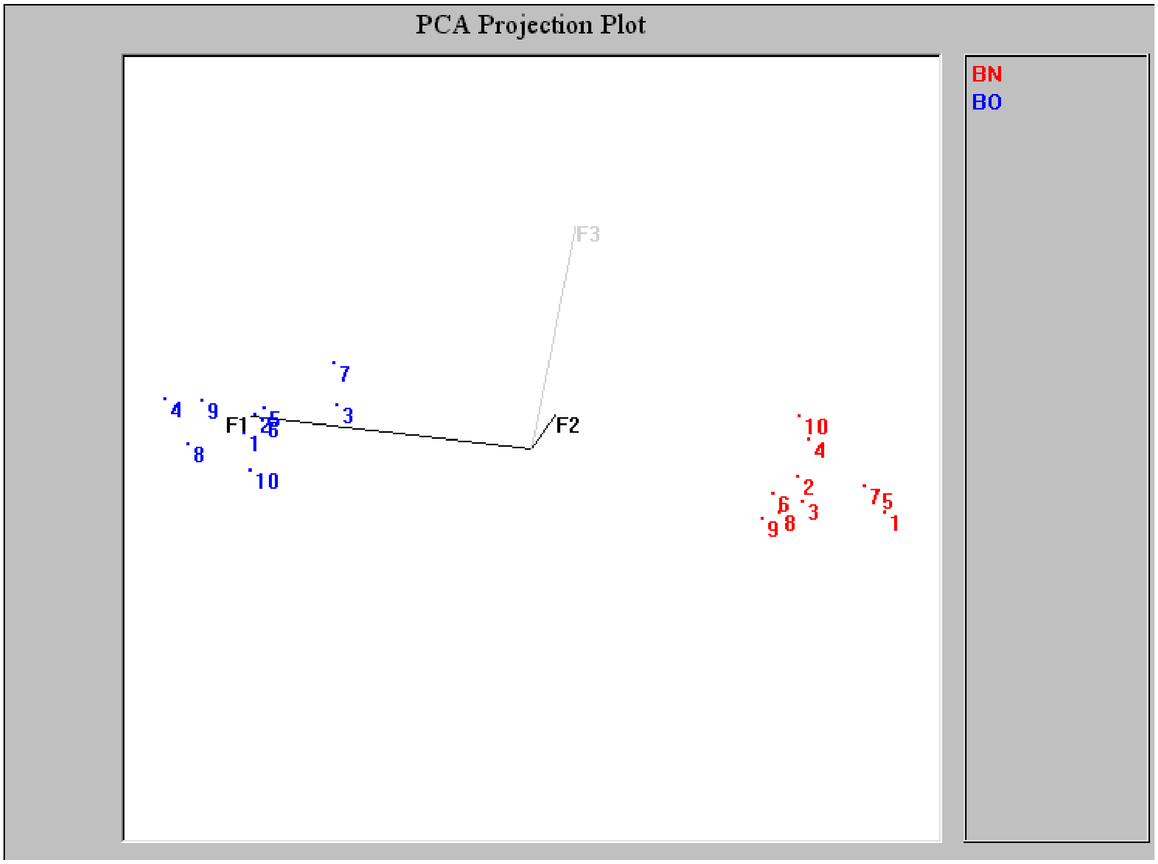

Figure 3. The PCA plot of the training set of fresh and old dried basil using CDA, autoscale with 1-normalization.

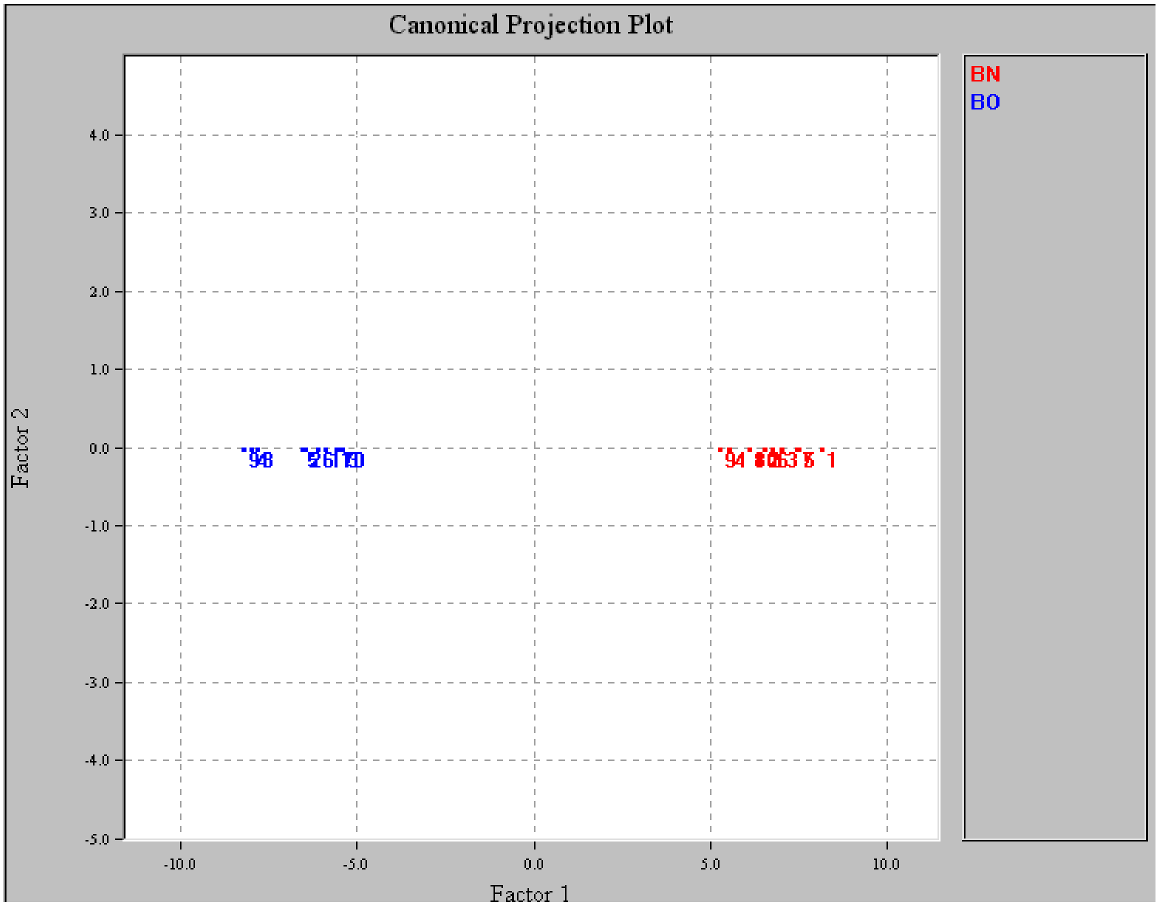

Figure 4. The CDA plot of the training set of fresh and old dried basil using CDA, autoscale with 1-normalization.

Identified As

Trained As	BN	BO
BN	10	0
BO	0	10

Correct : 100.000 %
Incorrect : 0.000 %

Interclass M-Distances

	BN	BO
BN		13.183
BO		

Figure 5. The internal cross validation of the training set of fresh and old dried basil using CDA, autoscale with 1-normalization.

Cyrano Sciences Inc, 73 N. Vinedo Avenue, Pasadena, CA 91107
Tel. 626-744-1700, Fax 626-744-1777
www.cyranosciences.com, info@cyranosciences.com