

Feedback calibration training improves whisky sensory profiling

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The Y2K Study

TRAINING



Sensory Descriptive Attributes and Definitions

Table 1. Aroma Spikes for the Whisky Panel, July 2000

Descriptor	Concentration	Stock solution	Recipe (into 100ml of BAS)
Smoky/wooded			140µl of flour
Real History Smoke Flavour			15µl of flour
Smoky charcoal			15µl of flour
80/20 Smoke Flavour			0.250ml of stock solution
Phenolic			
o-Cresol	0.050ppm	2.3µl of o-Cresol into 100ml ethanol (40%)	0.250ml of stock solution
o-Xylenol	0.050ppm	49µl of o-Xylenol into 100ml ethanol (40%)	0.250ml of stock solution
Phenol	10.0ppm	100µl of Isoamyl acetate into 100ml of water	3.27ml of stock solution
Floral			
Octenol	31.2ppm	780µl of Octenol into 100ml of water (200µ)	1.2ml of stock solution
Sweet-Caramel			
Caramel Labral Flavour			1.4ml of flour (Maltarin)
Sweet-Vanilla			
Vanilla Extract (Club House)			0.9ml of extract
Solvent			
Acetic Acid	1000ppm		0.9ml of white vinegar (1%)
Ethyl Acetate	50.0ppm		0.150ml of the Ethyl Acetate
Woody			
Octyl Extract			0.6ml of extract
Woody			
2,2,4-Trichloroacetate	4.0ppm	1.00mg Trichloroacetate into 100ml ethanol	1.2ml of stock solution
Earthy			
2-Ethylhexanoate	2.0ppm	70µl of Ethylhexanoate into 100ml ethanol (40%)	1ml of stock solution
Green/Grassy			
2-Ethylhexanoate	100ppm		20µl of C16-3-Phenol
Malty			
Maltol			20µl of C16-3-Phenol
Medicinal/sooty base			
Nutty			
Phenyl Ethyl Methanoate	90.0ppm		2.2ml of Phenyl Ethyl
Buttery			
Butyrol	2.2ppm	20µl of Butyrol into 100ml (20ml water + 70ml water)	3.2ml of stock solution
Butyrol			
Carbonyl spiked.com			

Based upon personal communications with John Piggott, 2000.
Lee, Paterson, Piggott and Richardson, 2001

TESTING



Means and ANOVA Results of Example Whiskies

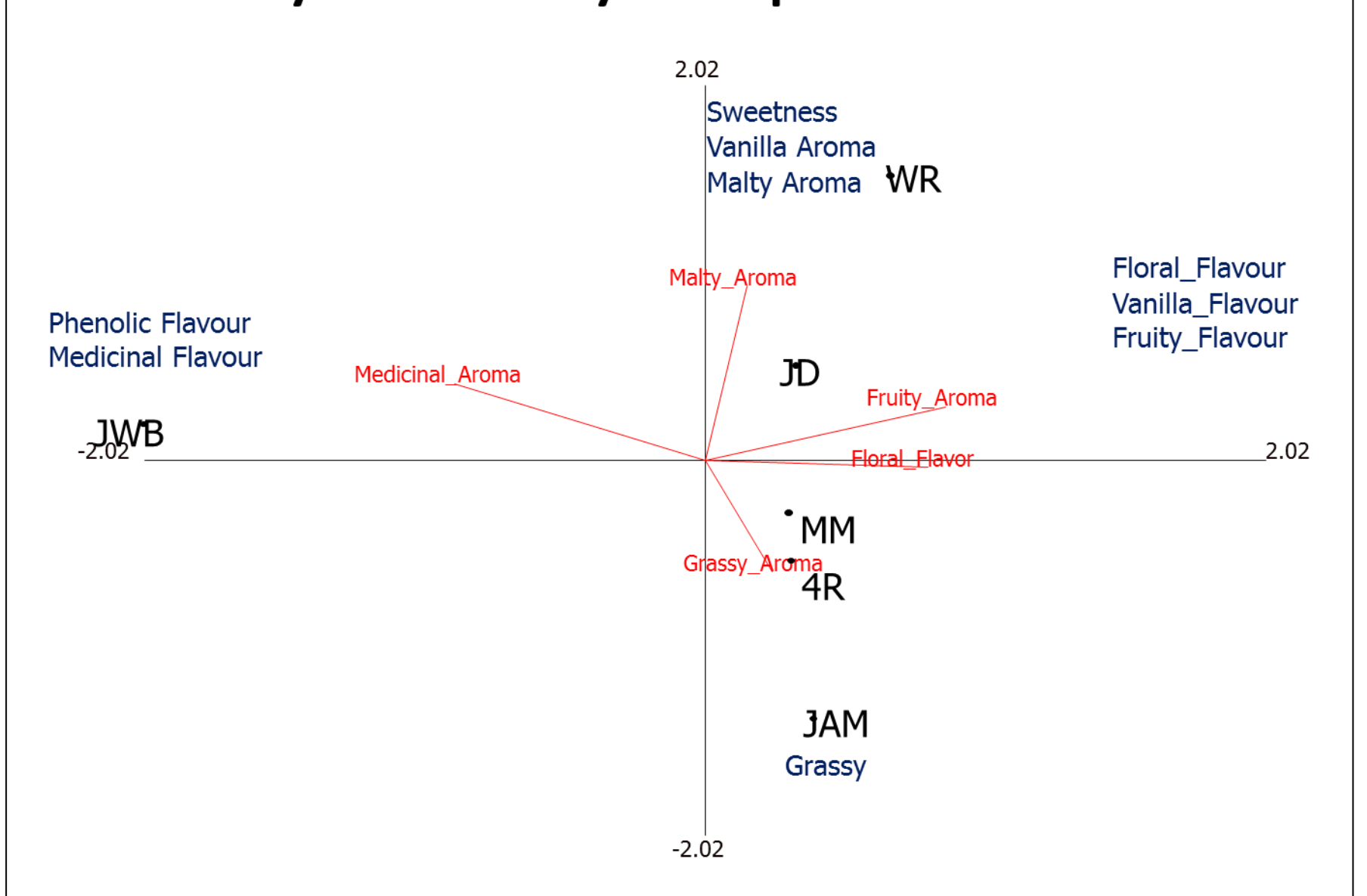
	p-value	LSD	JW	MM	JD	WR	FR	JAM
Medicinal Aroma	0.00	2.0	14.0	9.7	9.6	10.7	9.4	8.7
Phenolic Aroma	0.00	2.1	15.7	10.0	12.8	11.7	11.7	10.7
Tobacco Aroma	0.69	2.0	8.5	7.2	7.8	7.3	7.9	7.3
Cooked Cereal Aroma	0.75	1.2	5.9	5.5	5.3	6.1	5.2	5.3
Malty Aroma	0.05	1.8	7.7	7.5	8.0	9.0	7.2	7.2
Grassy Aroma	0.02	1.4	9.0	9.2	8.8	9.2	9.0	9.9
Fruity Aroma	0.02	1.9	6.4	8.4	8.5	9.2	9.8	9.3
Solvent Aroma	0.20	1.5	7.6	7.1	7.5	7.3	7.1	6.8
Vanilla Aroma	0.01	2.1	7.2	10.3	9.4	11.1	10.2	8.9
Oak Aroma	0.87	2.3	8.7	8.1	8.1	7.4	8.0	7.6
Cedar Aroma	0.27	1.8	6.4	7.5	6.7	5.8	6.4	5.5
Buttery Aroma	0.15	1.5	2.9	3.7	4.0	4.7	3.5	3.8
Nutty Aroma	0.35	1.6	8.1	9.3	9.3	10.5	9.4	9.0
Medicinal Flavour	0.00	2.2	15.3	10.4	9.2	10.7	9.9	9.4
Phenolic Flavour	0.00	2.1	17.5	12.5	13.7	13.1	13.0	11.9
Tobacco Flavour	0.19	2.0	9.8	7.9	8.0	7.5	7.9	8.0
Cooked Cereal Flavour	0.81	1.1	5.6	5.6	6.0	6.3	5.7	5.6
Malty Flavour	0.64	1.8	7.7	8.9	8.9	9.3	8.3	8.9
Grassy Flavour	0.00	1.3	8.3	9.4	9.4	10.0	9.3	9.0
Fruity Flavour	0.00	1.9	5.9	9.0	7.9	9.1	10.2	8.0
Solvent Flavour	0.01	2.0	11.1	13.6	14.4	14.9	13.5	14.8
Vanilla Flavour	0.00	1.7	7.5	9.9	9.8	10.7	9.8	10.5
Oak Flavour	0.65	2.1	10.3	9.1	8.6	9.2	8.3	8.9
Cedar Flavour	0.75	1.9	6.5	7.7	7.2	7.3	7.1	5.8
Buttery Flavour	0.53	1.4	2.6	3.7	3.8	4.1	3.8	3.3
Nutty Flavour	0.04	1.8	8.4	9.2	9.1	9.6	9.3	9.5
Sweetness	0.03	1.6	17.0	18.4	18.0	19.1	19.2	18.4
Smoothness	0.12	1.1	9.6	9.7	9.0	9.9	9.2	8.3

Means are based upon 7 replications per product.
All responses were collected on 100-point unstructured line scales.

EXAMPLE WHISKIES

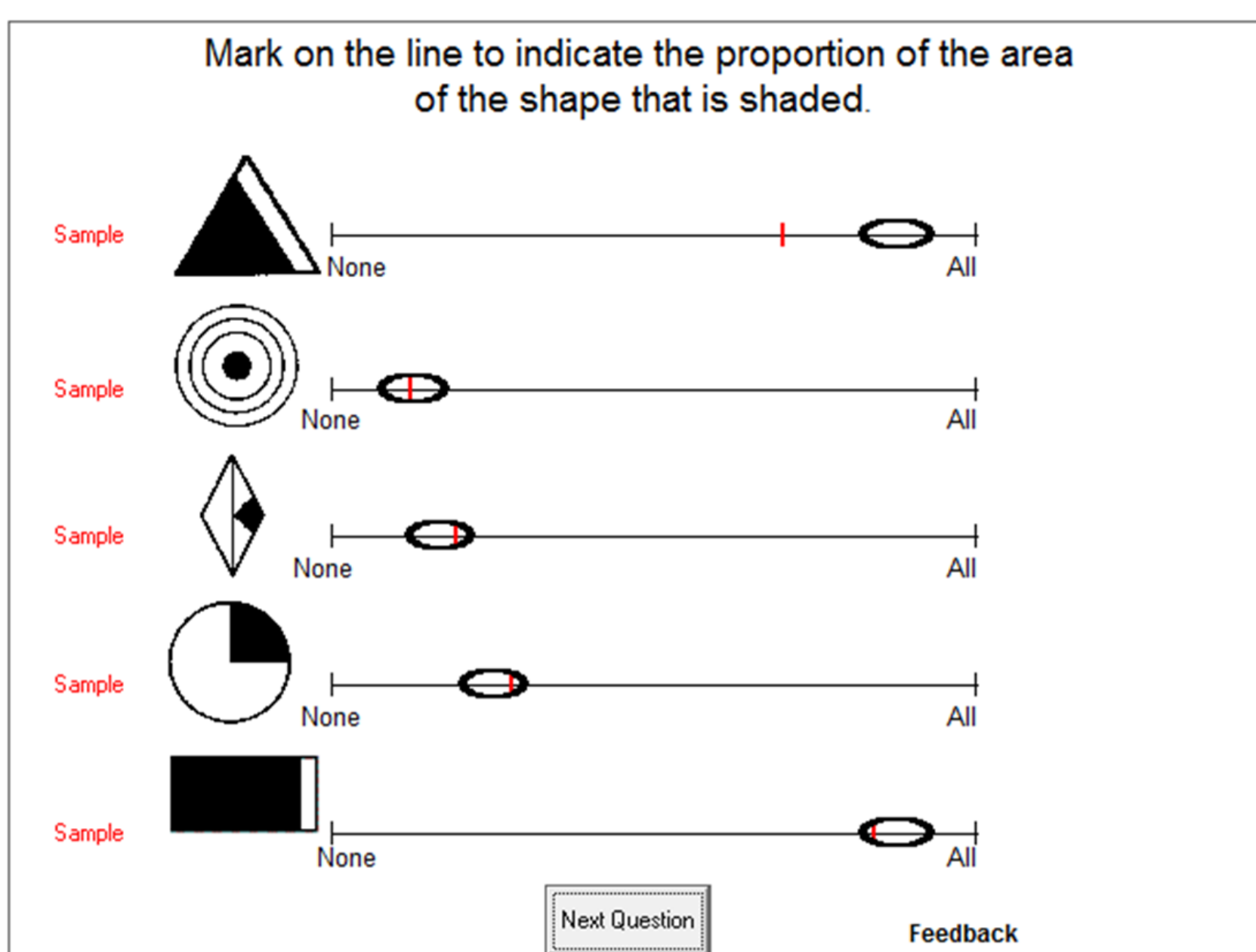


Whisky Sensory Map



Feedback Calibration

Immediate Feedback



FCM® Sensory Descriptive Analysis

1. Recruit and screen panelists
2. Identify the key sensory attributes of the product range
3. Apply a sensory order of operations approach to attribute development and classification
4. Develop meaningful feedback targets for individualized training
5. Use Feedback Calibration sessions to train the panel
6. Set proficiency targets for panelists
7. Assess the proficiency of the panelists and panel
8. Finalize the ballot
9. Measure the attribute responses for the products
10. Analyze and interpret product results

Sensory Descriptive Attributes and Definitions

Table 2. Aroma spikes for Whisky Panel, July 2012

Attribute	Definition	Left Anchor	Right Anchor	Reference Standard
Medicinal	Band-aid, antiseptic	None	Very Strong	Aroxa capsule: 4-ethylphenol
Phenolic	Phenolic (peaty)	None	Very Strong	Aroxa capsule: Guaiacol
Tobacco	Tobacco, hay, dry grass	None	Very Strong	Aroxa capsule: Beta-cyclohexyl Aroxa capsule: 2-ethylpyridine
Cooked Cereal	Cooked cereal, cooked grains	None	Very Strong	Aroxa capsule: 2-acetylpyridine Aroxa capsule: Isoamylaldehyde
Malty	Malt, malted barley	None	Very Strong	Happy Home Malt Syrup
Grassy	Fresh cut grass, green leaves, cuttings, green beans, green banana peel	None	Very Strong	Aroxa capsule: Cis-3-hexenol
Floral	Roses, violets, lilacs	None	Very Strong	Aroxa capsule: Beta-damascenone Aroxa capsule: Beta-ionone
Fruity	Banana, apple, peach, pear, cherry, black currant, prunes, plums, pineapple, orange, lemons, lime	None	Very Strong	Aroxa capsule: Isoamyl acetate Aroxa capsule: Ethyl hexanoate
Solvent	Nail polish remover, paint thinner	None	Very Strong	Aroxa capsule: Ethyl acetate
Vanilla	Vanilla, vanillin	None	Very Strong	Aroxa capsule: Vanillin
Oak	Oak, sawdust, papery	None	Very Strong	Aroxa capsule: Trans-2-nonenal Oak shavings
Cedar	Cedar	None	Very Strong	Cedar shavings
Buttery	Butter, diacetyl	None	Very Strong	Aroxa capsule: Diacetyl
Nutty	Hazelnut	None	Very Strong	Aroxa capsule: 5-methyl-2-hept-4-one

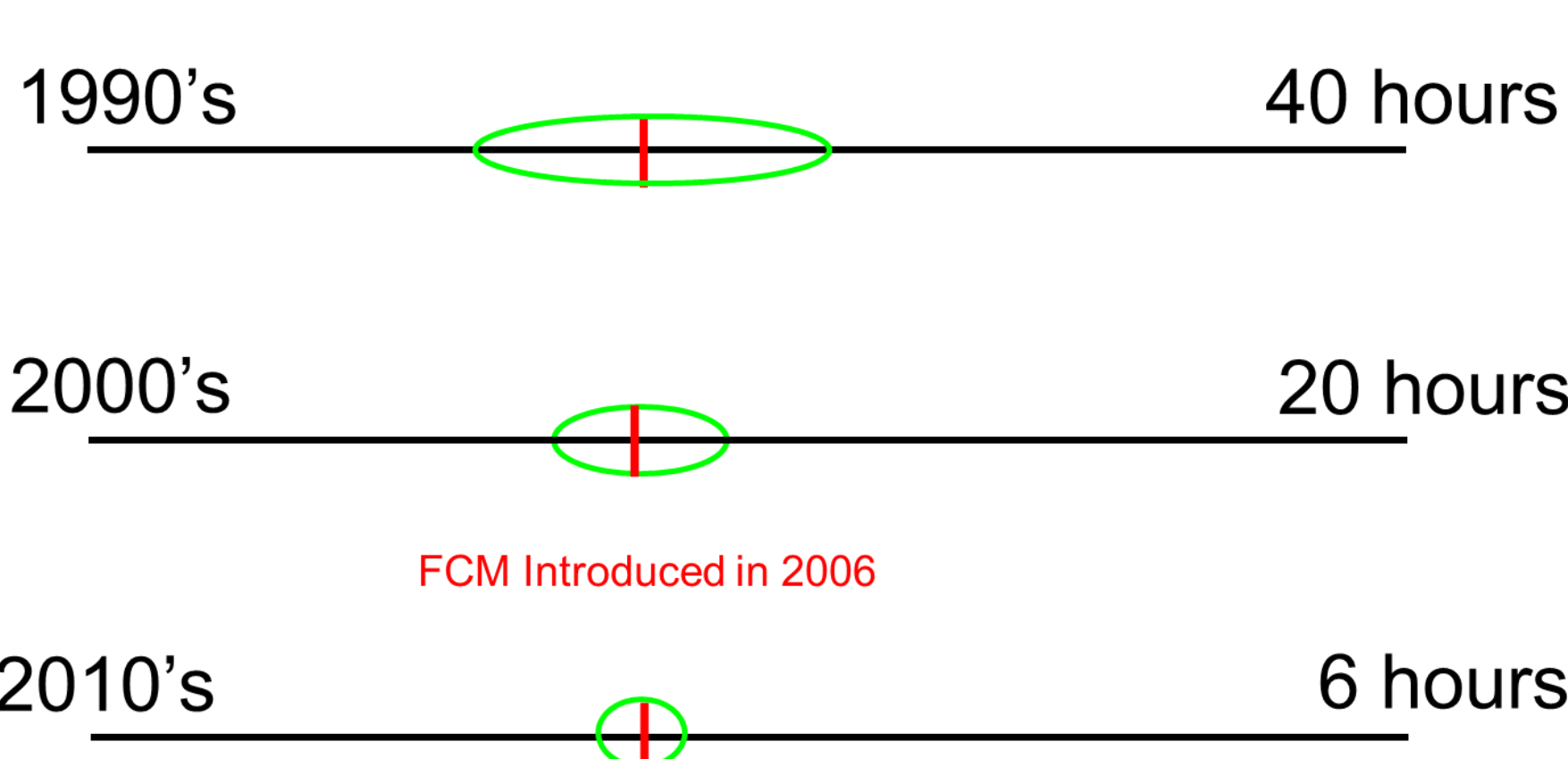
http://www.aroxa.com/

Comparing Y2K to 2012

Table 3. Least significant difference and training time of panels after introduction of FCM training. Attributes selected are matched between both panels

ATTRIBUTE Significant at p<0.05	Least Significant Difference	
	Year 2000	Year 2012
Fruity aroma	3.2	1.7
Floral aroma	3.3	1.7
Phenolic aroma	5.4	1.8
Smoky aroma	5.1	1.5
Sweet aroma	3.1	1.7
Phenolic flavour	3.8	1.6
Smoky flavour	3.8	1.5
On unstructured line scale anchored at 0 and 100	3.96	1.64
Whisky Training Time (h)	12	6

The Effectiveness of FCM Training



Calibrated Descriptive Analysis

When using FCM training...
Analytical sensory profiles of products are both more accurate and precise
Training time is greatly reduced
A library of the sensory properties of products can be created
Competitor profiles are meaningful
Reliable multi-attribute measures of sensory shelf life can be obtained.

References

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