POSTERS

Sensory and instrumental assessment of olive oil appearance

By **E. Pagliarini** and **C. Rastelli**
DISTAM Dipartimento di Scienze e Tecnologie Alimentari e Microbiologiche
University of Milan, Via Celoria 2, 20133 MILANO - ITALY

SUMMARY

Sensory and instrumental assessment of olive oil appearance

This work aimed to establish parameters concerning colour and turbidity of extra virgin olive oils by comparing consumers' visual perceptions with analytical measurements using a tristimulus colorimeter and a turbidimeter.

The Principal Component Analysis (PCA) was applied to explain the differences between the various oils in terms of analytical parameters (L, a, b and NTU) and sensory attributes (Yellowness, Greeness and Turbidity). The results showed that the instrumental and sensory parameters are strongly correlated.

KEY-WORDS: Appearance - Colour - Extra virgin olive oil - Turbidity.

1. INTRODUCTION

Aroma, taste and appearance play a particularly important role in consumer perception of extra virgin olive oil.

Researchers have traditionally concerned themselves with the sensory characteristics of extra virgin olive oil, especially on flavour (Camurati, Cozzoli, Fedeli, 1985; Gasparoli, Fedeli, Manganiello, 1986; Aparicio, Gutierrez, Morales, 1992) but little work has been done on the visual characteristics such as colour and turbidity, which play a significant role in determining the consumer choice and preference.

The colour of the product is the first characteristic that strike the consumer and the impression it makes determines his/her judgment as to wholesomeness and desiderability. Consumer relates his/her impression to past experience, habits or taste (Clydesdale, 1993) and this may lead to acceptance or rejection.

2. OBJECTIVE

The objective of this work has been to establish parameters concerning colour and turbidity of extra virgin olive oils.

This was achieved by comparing consumers' visual perceptions with analytical measurements.

3. METHODOLOGY

3.1. Materials

Extra virgin olive oils were mixed to obtain various colour (yellow-green) and turbidity (limpid-turbid) formulations.

Seed oil was added to extra virgin olive oil and filtered through anhydrous Na_2SO_4 to obtain a limpid-yellow sample.

Various shades of green were obtained by adding estracts of ground olive leaves.

Different degrees of turbidity were obtained by adding Tween as surfactant and various amounts of water.

Fourthy-five samples of oil were obtained and evaluated instrumentally. From these 8 samples were selected for sensory evaluation.

3.2. Methods

Instrumental assessment of turbidity

Sample turbidity was measured by means of a Hach turbidimeter (mod. RatioTurbidimeter 18910, Hach Europe Sa, Namur, Belgium), previously calibrated using a formazine solution. Turbidity was expressed as NTU (Nephelometric Turbidity Units). Five replicates were carried out for each sample.

Instrumental assessment of colour

The colour of the 45 oil samples was determined by a colorimeter (Chromameter II Reflectance, Minolta Camera Co., Japan). A white tile n° 101947 was used to standardize the instrument.

30 ml of oil was poured into a glass capsule with a thick layer of black teflon wrapped around the side in order to produce an opaque reflective surface.

The colorimeter measured the values L, a and b of the CIELAB colour difference equation developed from the Hunter System (Francis and Clydesdale, 1975).

Yellowness index (YI) was expressed as:

$$YI = 142.86\ b/L$$

Greenness Index (GI) was expressed as:

$$GI = tang^{-1}(a/b)$$

3.3. Sensory evaluation

Panel

After a selection phase, a panel of 10 trained judges (5 men and 5 women, all university students) was employed.

Samples

Eight samples were selected for the sensory test.

The evaluation was carried out in daylight. 25 ml of each sample were placed in glass test-tube on a white background.

Table I

Instrumental turbidity (NTU) and colour (L,a,b) values of the eight oils used for the sensory test.

SAMPLE	TURBIDITY (NTU)	COLOUR L	a	b
A	11.64	30.83	-1.21	18.69
B	26.00	28.03	-1.40	13.80
C	9.65	33.17	-2.68	22.47
D	10.58	32.61	-2.59	20.93
E	12.41	25.93	0.47	10.83
F	47.56	21.99	1.14	3.49
G	12.27	25.30	0.67	8.87
H	18.06	23.57	0.92	6.54

Rating test

The 8 oils were rated and the results replicated three times.

The judges were asked to estimate the intensity of Yellowness, Greenness and Turbidity on scales from 1 to 9. 9 represents a perfect match with the reference oil.

Statistical analysis

Data were processed according to the Principal Component Analysis (PCA) using the SIMCA/MACUP program (Wold, Sjostrom, 1977).

4. RESULTS AND DISCUSSION

Figure 1 represents the colour and turbidity space of the 45 samples used in the test.

As one can see the different samples cover a wide area of space which reflex the variability of the products available on the market.

In addition, it can be noted that the 8 samples selected for the sensory test (identified by letters) are well distributed inside the space, both in terms of colour (YI and GI) and turbidity (NTU).

Multivariate analysis

Principal Component Analysis (PCA) was used to evaluate the correlation beetween instrumental and sensory evaluation for the 8.

This method allows to reveal the principal relationships between the variables.

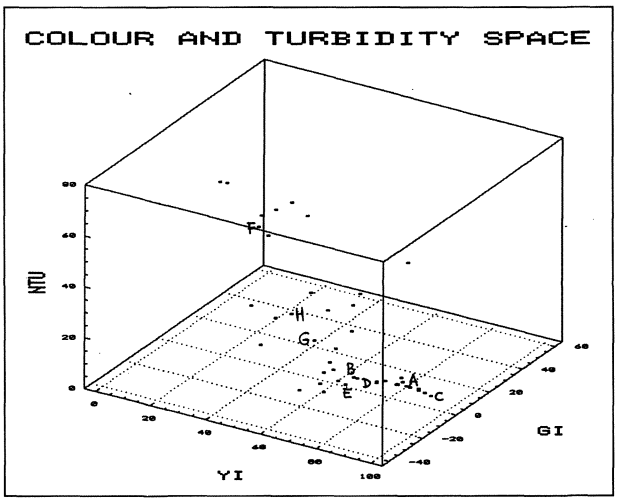

Figure 1

The PCA results are reported as score plot in figure 2: the two components of the PCA model explain a fraction of variance of 90%.

The 8 samples are well distributed in the space of the first two components and the model fits the experimental data very well (%V=90%).

By placing the loading plot, which represents the distribution of the instrumental and sensory parameters, over the score plot (figure 3) one notes that:

1) it is possible to explain the differences between the various oils in terms of analytical parameters and sensory attributes;
2) in particular, along the first component the oils separate themselves on the basis of colour grading (from yellow to green), whereas the second component contribute to separate the samples on a basis of grades of turbidity.
3) in addition, the instrumental and sensory parameters are strongly correlated: perceived yellowness vs. YI and values L and b; perceived turbidity vs. NTU.

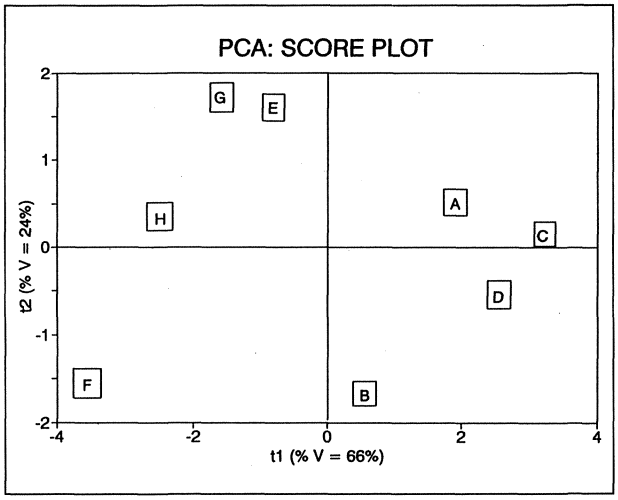

Figure 2

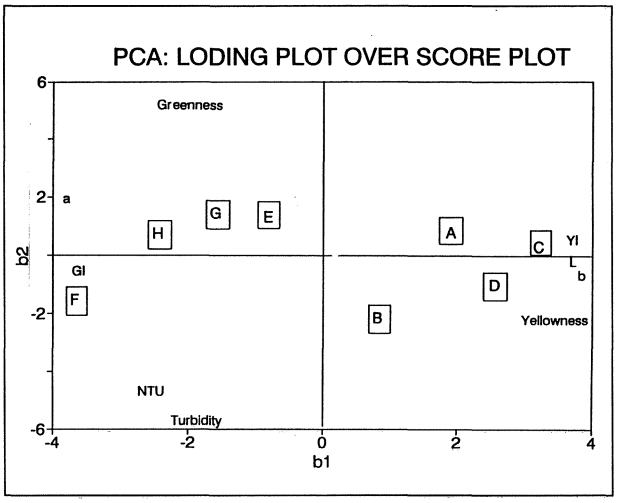

Figure 3

In conclusion, it can be seen that a strong correlation exists between the analytical measurements of the extra virgin olive oil appearance and the sensory perceptions of the panellists.

These results make possible to standardize the appearance perceived by the consumers through a simple and reliable instrumental methodology.

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