

# "Harmony" of Extra Virgin Olive Oils (EVOOs)

## Insights from the long-term project "International Olive Oil Award – Zurich"

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### Background

During the evaluation of EVOOs within the annual "International Olive Oil Award – Zurich" (a long-term project organized by the Sensory Science Group of ZHAW) the Swiss Olive Oil Panel (SOP) uses an extended methodology for the sensory evaluation of EVOOs. Based on the methodology of the "panel test" (EC 640/2008), the extended methodology is cross-validated between several panels, e.g. the Swiss (SOP) and the German olive oil panel (DOP). Using this methodology and thereby exceeding the verification of the category "extra virgin", additional descriptors are used to realize a quality-discrimination within the category of EVOOs. The attribute "harmony" in particular is responsible for this improvement of the methodological approach [1]. Using "harmony" as a quality-factor, the discrimination between "Not acceptable" and "Excellent" quality within the category of EVOOs is possible.

### Practical Approach / Research Questions

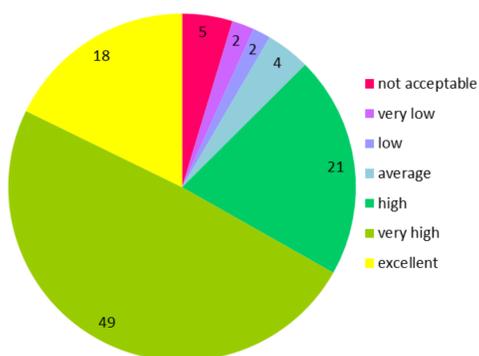


Figure 1:  
Quality Levels 2009-2014 (%) (n = 673)

Statistically analyzing project data (n = 726, including defective, not acceptable and oils with very low quality) of the last six years (2009 up to 2014) [Figure 1], allows answering selected research questions and explaining relations between selected quality criteria of n = 673 as "extra virgin" confirmed oils.

Altogether 94% (n = 639) of these oils were above "average" and showed "high" (19%), "very high" (50%) and "excellent" quality (19%).

### Findings

A highly significant correlation ( $p < 0.0001$ ) exists between harmony values and the intensity of fruitiness ( $R^2 = 0.542$ ) [Figure 2]. Until a certain level of fruitiness (5 on a 10 cm intensity scale) harmony values augment. Almost the same picture can be found for the intensity of pungency ( $R^2 = 0.057$ ) [Figure 3] and the intensity of bitterness ( $R^2 = 0.027$ ) [no Figure]. Until a level of 3 on a 10 cm scale harmony values increase.

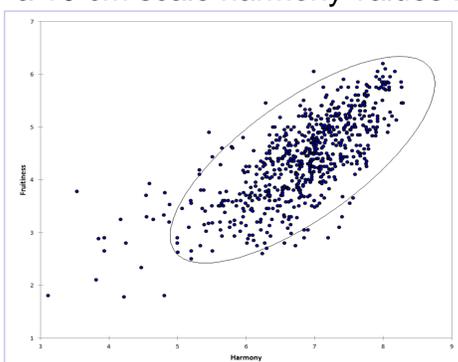


Figure 2:  
Harmony values and intensity of  
fruitiness are significantly correlated  
( $R^2 = 0.542$ , n = 673)

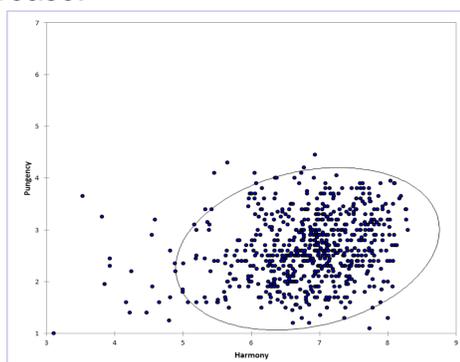


Figure 3:  
Harmony values and intensity of  
pungency are significantly correlated  
( $R^2 = 0.057$ , n = 673)

#### Literature:

[1] A. Bongartz, D. Oberg: Sensory Evaluation of Extra Virgin Olive Oil (EVOO) Extended to Include the Quality Factor „Harmony“; Journal of Agricultural Science and Technology A1 (2011), 422-435

### Findings (continued)

The analysis of variance (anova) calculated with data of 6 different regions (Andalusia (ES), Córdoba (ES), Apulia (IT), Sicily (IT), Crete (GR) and Peleponnes (GR)) regarding the fruitiness, bitterness, pungency and harmony showed the following results:

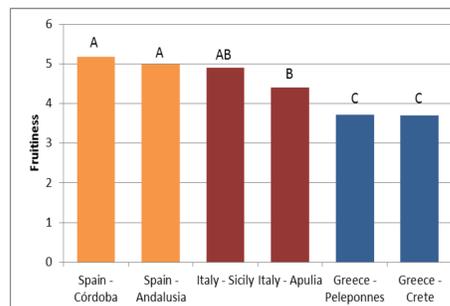


Figure 4:  
Fruitiness of different regions  
ANOVA ( $p < 0.001$ , n=283)  
different letters show significant differences

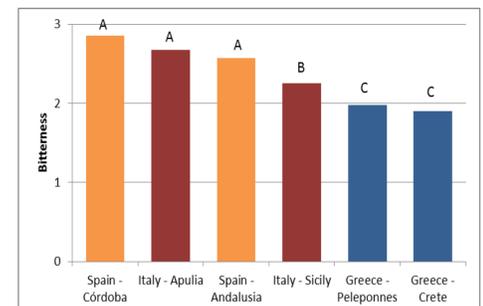


Figure 5:  
Bitterness of different regions  
ANOVA ( $p < 0.001$ , n=283)  
different letters show significant differences

Both Greece regions show significantly lower intensity of fruitiness [Figure 4], bitterness [Figure 5] and pungency [no figure].

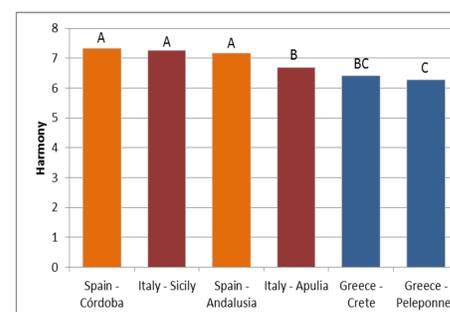


Figure 6:  
Harmony of different regions  
ANOVA ( $p < 0.001$ , n=283)  
different letters show significant differences

Both spanish regions (Andalusia, Córdoba) as well as Sicily (IT) show significant higher values of harmony compared to all other regions [Figure 6].

Production criteria as there are organic, cold extraction / pressing and mono-varieties seem to have no impact on quality differentiation within the grade of EVOOs [Table 1].

In no case significant differences regarding harmony could be found within the production criteria.

Production Criteria		
Organic Production	organic	conventional
n =	131	542
Cold extraction / pressing	cold ex./pr.	regular
n =	248	425
Mono-Varieties	mono-varieties	blends
n =	351	322

Table 1: Overview of EVOOs with specific production criteria (n = 673)

### Outlook

A better differentiation between olive oils within the grade of EVOO is possible by using insights concerning the relevance of quality criteria. Especially the "harmony" value is a good predictor of different quality levels within the range of EVOOs. Any helpful information towards consumers as well as a serious and objective "Sensory Marketing" of EVOOs should rely on these additional aspect.

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