

Phenomenal Phenols

The Unique EVOO Opportunity

Phenols, or polyphenols as they are often called mainly define EVOO's health benefits, flavour, colour, texture and shelf life – and offer a unique growing, marketing and price opportunity for olive growers and producers.

Phenols are found in wine, tea, cocoa, fruits and vegetables. They are classes of natural anti-oxidant preservatives for plants, and for humans consuming them. Olives contain high concentrations of phenols. Among the 30 phenols found in EVOO, some are not found in other vegetable oils, and EVOO is the only edible oil to retain high phenolic content.

Phenols are an EVOO phenomenon. They are a game-changer for the olive industry. In this industry-good paper, two growers background phenols for a presentation at the Olives NZ AGM, March 19, 2016. The paper discusses, with references:

- What are phenols
- Why they are important
- How to increase phenols in your olives and oil
- What the New Zealand industry can do with phenols

Phenols

Many will be familiar with polyphenols or TPP, part of EVOO chemical analysis for certification. Phenols are a general class of chemical compounds consisting of simple phenols and polyphenols, amounting to 1-3% of an olive by volume. Phenols delay the onset of oxidation and rancidity in oil.

Due to minimal processing, EVOO is the only oil that retains important natural phenols. Other grades of olive oil ("pure" and "light"), and vegetative oils such as soybean and canola, are further pressed and refined, processes that strip away phenols. Virgin coconut oil is low in phenols.

"Epidemiological studies and associated meta-analyses strongly suggest that long term consumption of diets rich in plant polyphenols offer protection against development of cancers, cardiovascular diseases, diabetes, osteoporosis and neurodegenerative diseases."

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835915/>

The total phenol content is typically expressed as mg/kg of olive oil. The phenolic range in EVOOs is normally 50 to 800 mg/kg. The higher the value, the greater the oil's preservative and health benefits. Phenols also correspond to sensory properties, with robust oils above 300 mg/kg while mild oils are below 180 mg/kg.

Phenol levels in olive fruit and oil are affected by fertilisation, irrigation, tree age, UV exposure, olive maturation, harvesting, processing, storage, cooking methods.

<http://phenol-explorer.eu/reports/45>; http://agbiolab.com/files/agbiolab_Polyphenols.pdf

Benefits

Positioning

In some countries, and possibly soon in Australia and New Zealand, “traffic light” or point system consumer food guides are used. The UK experience has been to lump animal fats and inferior oils with EVOO without differentiating relative health and other benefits. The need to distinguish EVOO, most usefully using phenols, is widely recognised.

<http://www.theland.com.au/news/agriculture/horticulture/general-news/health-fight-continues-for-olive-oil/2745587.aspx>

There is no current official health claim for EVOO or phenols in New Zealand, although EU labelling [regulation 432/2012](#) states: “Olive oil polyphenols contribute to the protection of blood lipids from oxidative stress.” There is a similar health claim approved by the US Food and Drug Administration.

Consumers show preference for natural, plant-based products, especially those with proven and perceived health benefits. Above all other oils EVOO contains and retains plentiful phenols.

<http://www.foodnavigator.com/Market-Trends/Top-10-food-trends-of-2016>

Differentiation of EVOO against claims by other oils is essential to positioning EVOO as a quality product. For example, virgin coconut oil contains between 4-50 times less phenols compared to EVOO, and EVOO has multiple times more phenols than processed coconut oil.

http://www.aromadictionary.com/EVOO_blog/?p=296

Price

There is increasing evidence from Europe that EVOO is being priced by reference to phenols.

“...High polyphenol content appeals to demanding foreign markets for both pharmaceutical use and the gourmet restaurants of Italy, the USA and England.”

<http://www.oliveoiltimes.com/olive-oil-making-and-milling/greece-early-harvest-olive-oils/49122>

Flavour and Colour

Pungency and bitterness are produced by phenolic compounds responsible for the [health qualities of extra virgin olive oil](#), such as oleocanthal — an anti-inflammatory and anti-tumor substance named by researchers from Latin: oleo=olive, canth=sting, al=aldehyde for the “stinging” flavor it gives to fresh EVOO.

Early harvest increases both phenolic level and chlorophyll (deep green colour) content in olives.

Health

“The health benefits of olive oil are 99 percent related to the present of phenolic compounds, not the oil itself.” Nasir Malic, research plant physiologist, US Department of Agriculture.

<http://www.livescience.com/37998-olive-oil-health-benefits.html>

Most important, the more phenols EVOO contains, the greater the health benefit.

<http://olivecenter.ucdavis.edu/research/files/blood-lipid>

Some of the specific health benefits of phenols can be found in these links:

<http://www.oliveoiltimes.com/olive-oil-health-news/mediterranean-diet-with-evoo-reduces-cognitive-decline-in-older-age/50470>

<http://www.oliveoiltimes.com/olive-oil-health-news/mediterranean-diet-higher-rate-of-remission-in-type-2-diabetes/50468>

<http://www.oliveoiltimes.com/olive-oil-health-news/olive-oil-may-be-useful-in-brain-cancer-chemoprevention/50501>

<http://www.oliveoiltimes.com/olive-oil-health-news/olive-oil-polyphenols-reduce-bad-cholesterol-and-plaque-formation/48333>

<http://www.oliveoiltimes.com/olive-oil-health-news/med-diet-with-extra-virgin-olive-oil-reduces-incidence-of-invasive-breast-cancer/50611>

<http://www.oliveoiltimes.com/olive-oil-health-news/mediterranean-diet-with-olive-oil-shown-to-modulate-gut-bacteria-improve-insulin-sensitivity-and-metabolic-syndrome/50505>

OliveMark™

Olives NZ's "OliveMark" is used with certified EVOO. Phenols are currently non-mandatory for certification, and will not be included in certification testing for 2016 oils. As established, phenols are the basis for much of EVOO's comparative quality, flavour, health benefits, value and reputation.

New EVOO chemical testing methods, and certification for Ultra-Premium Extra Virgin Olive Oil (TPP >130 mg/kg, in Australia for example), include phenolic content as mandatory measures.

<http://www.oliveoiltimes.com/olive-oil-basics/olive-oil-grades/researchers-use-optical-spectroscopy-to-classify-olive-oils/49948>

Growing and production

Most research associates production of high phenolic levels in olives and EVOO with high standards in growing methods, harvesting, processing and storage.

Olive Production Manual, 2nd edition, Steven Sibbett & Louise Ferguson (eds), chapter 23.

<http://oliarola.com/data/PDF/Servili2002.pdf>

Growing for quality (e.g. high phenols) is as important as growing for quantity. For olives, phenols are generally involved in defense against ultraviolet radiation or aggression by pathogens, and as a product the higher the phenolic content in EVOO, the greater the health benefit.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835915/>

Currently, Olives NZ's "Focus Grove Project", which aims to make groves more productive and profitable, does not include the objective of increasing phenolic levels in EVOO.

In Greece and some other jurisdictions, varietal phenolic levels are recorded by growers, regions and nationally, year on year, in a similar and voluntary manner to fruit production and oil yield recorded by Olives NZ. There is evidence that phenols have price benefits to growers, along with improved market and consumer reputation for groves and nations producing high value phenolic EVOO.

<http://www.oliveoiltimes.com/olive-oil-making-and-milling/greece-early-harvest-olive-oils/49122>

Growing

Phenolic levels in olives and oil are affected by a range of factors, from on-grove practices through to storage, to in-kitchen use. The phenolic content achieved in olives and EVOO is affected by:

- **Varietal.** Genetics influences phenolic content, with high levels associated with Koroneiki, Picual, Coratina, while lower levels are found in Arbequina, Picudo, Sevillano.
- **Climate.** Warmer, drier climates produce high phenols than colder, wetter conditions.
- **Growing.** Tree health and nutrition can influence phenols. Over-supply of nitrogen is known to decrease phenolic levels in fruit.
- **Irrigation.** Fruit production increases with irrigation, but over-watering near harvest is likely to reduce phenols.
- **UV exposure.** Sun exposure increases phenols in olives, underlying the importance of open pruning methods.
- **Harvesting method.** Rougher treatment of olive fruit and exposure to the elements reduces phenols.
- **The age of the trees.** Older trees contain significantly higher phenol content.
- **Olive maturation.** Green olives contain more phenolic content than ripe olives, though it's easier to extract more oil from riper olives.

- **Processing.** The less processing, the better. "Extra virgin" olive oil, which is cold-pressed only once, has the highest phenol levels. Further presses, for "virgin" and other oils markedly reduce phenolic content. Highly refined or "light" olive oils, which use heat or chemicals in the refining process, have significantly lower phenolic levels.

<http://www.oliveoiltimes.com/olive-oil-making-and-milling/soil-may-impact-certain-olive-oil-phytosterol-levels/40018>

- **Infusion.** Infusing EVOO reduces phenolic content.
- **Storage.** Any exposure of the harvested olives or the oil to heat, light or air will reduce phenol content. A constant storage temperature of 15C appears optimal.

<http://www.oliveoiltimes.com/olive-oil-making-and-milling/storage-temperatures-big-impact-on-shelf-life-of-high-phenolic-olive-oils/50509>

→ **Cooking.** If you're using extreme heat in cooking, you'll most likely lose the phenols, but at moderate heat EVOO retains many of its phenols, and actually builds nutrition.

<http://www.businessinsider.com.au/some-fried-foods-are-more-nutritious-2016-1>

Taking Advantage of Phenols in New Zealand

Marketing

Phenols are usefully described as “nature’s anti-oxidants”, which many consumers understand as beneficial to their health. As all marketing begins with a product, phenols along with flavour are EVOO’s passport to a high value product and brand category.

Manuka honey has Manuka Honey Factor (MHF). EVOO has phenols, the unique marker to position and promote EVOO, and support the OliveMark™.

Growing Quality

Phenols are a quality measure for olive growing and EVOO production. Phenols protect olives and olive oil. They provide considerable health benefits to consumers.

Achieving the highest phenolic content in olives and olive oil should be a primary aim of all groves in New Zealand, and a stated quality objective of the Focus Grove Project.

Certification Testing

To market and sell EVOO with a phenolic positioning requires evidence. All growers can obtain TPP measures with their EVOO certification. New methods of analysis contain TPP.

<http://www.oliveoiltimes.com/olive-oil-basics/olive-oil-grades/researchers-use-optical-spectroscopy-to-classify-olive-oils/49948>

Health Claim

The Ministry of Health and Department of Primary Industries in New Zealand are now refining all product health claims. There is an opportunity for Olives NZ to advance evidence and wording for a provable health claim to benefit EVOO. A useful start is the health claim for polyphenols approved for use in the UK and the US.

Industry Data

Historical phenol data for the New Zealand olive industry is held by Olives NZ. There is no analysis of this data by varietal, region or nationally, as is done in Greece, for example. While 2016 certification will **not** contain TPP, growers can obtain their TPP levels and could provide these voluntarily to Olives NZ along with their production figures. Such data will be invaluable to growers and to the industry to position NZ EVOO as a high value product.

Last word

Tom Mueller, noted olive industry critic, states in his book, “Extra Virginity”: “...Polyphenols and the other minor components of olive oil, which constitute a scant 2 percent of its volume, are the main source of the oil’s health benefit...” “...olive oil labels rarely communicate this crucial health data (polyphenols) – most contain just a heart health message about the fatty acids in olive oil, which lumps extra virgin olive oil and refined oil together as one undifferentiated category...”.

Ross Vintiner & Ray Lilley
Growers and Producers

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