The natural chemistry of Australian extra virgin olive oil

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The chemical composition and quality characteristics of Australian olive oil was investigated in RIRDC publication no. 06/132 (Mailer, 2007). The project produced a short 16-page document which summarised results from another project (RIRDC publication no. 08/167) (Mailer and Ayton, 2008), as well as some results from the Wagga Wagga Oil Testing Service in 2005/2006.

Fruit samples for the research project were collected from predominant cultivars from four different regions, including NSW, central Victoria, southern Victoria and Western Australia in the 2005 and 2006 growing seasons.

Cultivars

Arbequina
Barnea
Coratina
Corregiola
Frantoio
Koreneiki
Manzanillo
Leccino
Pendolino
Picual

Oil was extracted from the fruit using a laboratory scale olive oil extraction unit to ensure that extraction conditions were identical for each sample and any differences were from varietal, seasonal or environmental effects.

Fatty acid composition

Fatty acid composition results showed significant variation for each variety, dependent on the growing region. Some individual results for fatty acids exceeded the International Olive Council (IOC) standard limits, including those for oleic, linoleic and linolenic acids.

Sterols

Results for total sterols showed that Australian olive oils were generally compliant with IOC standards, however, there were some varieties such as Koreneiki, Coratina and Pendolino which sometimes fell below the limit ($\geq$1000 mg/kg oil).

Individual sterols contents were analysed. Olive oil varieties Barnea and Koreneiki generally exceeded the IOC limit for campesterol ($\leq$4.0% of total sterols), although other sterols were generally compliant.

Wax and Trans fatty acids

Wax content and trans fatty acid composition were compliant with IOC standards.

Additional analysis

A summary of results for free fatty acids, peroxide value and sensory evaluation for samples analysed by the Oil Testing Service commercial laboratory in 2005/06 were reported. The mean value of 0.26% for free fatty acids (FFA) and 9.03 mEq O_2/ kg oil for peroxide value (PV) from 1800 samples were well below the IOC limits of $\leq$0.8% and $\leq$20 mEq O_2/ kg oil for FFA and PV respectively.

Recent developments

A scientific paper was published by the authors using the data from this research (Mailer et al., 2010). This paper has been cited more than 100 times in peer reviewed journals by researchers doing similar work. Reports from Italy (Piscopo et al., 2016), China (Liu et al., 2021) and Turkey (Demirag and Konuskan, 2021) indicate that the oils in those studies were generally compliant to IOC limits for fatty acid composition and sterols. Conversely, research from Argentina (Rondanini et al., 2014), Brazil (Rondanini et al., 2014), Iran (Noorali et al., 2014) and Greece (Skiada et al., 2020) show some oil do not comply with IOC limits for fatty acid composition and sterols. While harvest timing, type of extraction, storage conditions and other factors can influence the composition of olive oil, some varieties, such as Koreneiki and Barnea are generally outside limits regardless of other influences.

Authorities from Australia, as well as several other countries including U.S.A., Argentina and Canada are constantly lobbying organisations such as the IOC and CODEX Alimentarius to review olive oil standards to ensure authentic oils from “non-traditional” growing regions are not unfairly classified due to differences in chemical composition.

Future research

New research in Australia using remote sensing equipment including satellite, airborne and ground based equipment is being conducted by several university and state-based agencies. While the initial aim is to use the technology to predict oil content, tree/fruit health and water availability, eventually these methods could be used to predict quality parameters in olive oil.

With the increasing focus on climate change and the effect it will have on agricultural production, research on the effect this will have in olive growing regions will be important. Determining changes to orchard management, harvest timing and irrigation to adjust to the implications of climate changes should be considered. Climate change will also affect the compliance/non-compliance of oils to currently recognised international standards, therefore periodic assessment of the current status of olive oil composition should be considered.

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